JANUARY

Bender IB. Factors influencing the radiographic appearance of bony lesions. J Endodon 1997;23:5-14.

PURPOSE: To determine the percentage of mineral bone loss that is required to produce a radiolucent area.

M&M: Bone lesions were created in five flat sections of bone (not curvilinear either on the periosteal or endosteal side) cut from 5 different cadaver mandibles. Radiographs were taken of the cortical and trabecular bone at varying thicknesses at 65 KV_p, 10 mA, exposed for 0.4 seconds, and developed under constant conditions. The lesions were cut in cortical bone on both the periosteal side and endosteal sides. Mineral bone loss (MBL) was calculated, and the radiolucent areas were classified according to four categories characterized by the degree of lucency.

RESULTS: The lowest percentage of cortical bone loss producing a radiolucent area was 12.5% with a 6.6% MBL. Distinct radiographic visualization with greater rarefaction was reported by all observers at 14.3% or more than 12.5% bone loss, with an average of 7.1% MBL. All three observers were in agreement regarding the latter result; whereas, in the former result, disagreement occurred in four observations. The sizes of the experimental lesions measured on the endosteal side were not too accurate. The thicker cortex needed a deeper cut to produce a radiographic visualization. Experimental lesions from 1 to 7 mm in most cancellous bone produced no radiolucent areas in cortical bone specimens 8 mm thick. The percentage of MBL in cancellous bone could not be determined.

C&C: The beginning of the paper has a very good descriptive review of the classical literature on radiographic detection of bone lesions. The ability to visualize lesions radiographically depends on the variations in thickness of hard structures, the constancy of composition according to mineral per unit volume of tissue, and the direction in which the X ray traverses the object (the angulation). The MBL was based on the conclusion that pure bone tissue consists of 50-55 volume percent of mineral, 30-35 percent of organic material, and 10-15 percent of water. The ability to detect radiographic lesions can vary depending on the location of the lesion in different bone sites (such as periosteal cortex, cancellous and junctional, or endosteal bone). The most consistent results with the least variations occurred in the periosteal cortical bone. Based on the results, the author concluded that the highest concentration of mineral per unit volume was located in the periosteal cortex, with slightly less in the endosteal cortex, and the least amount in the cancellous bone. The amount of MBL in cancellous bone does not significantly affect the radiographic results. Although it is generally agreed (in the literature) that 30% to 50% mineral loss is required before radiographic rarefaction is visualized in osteoporotic bone, these percentages *do not* apply in local resorptive lesions.

January 1997 **Orest M. Harkacz, Sr.**

Haikel Y, Serfaty R, Bleicher P, Thin-Thin CL, Allemann C. Effects of cleaning, chemical disinfection, and sterilization procedures on the mechanical properties of endodontic instruments. J Endodon 1997 23:15-8.

PURPOSE: To evaluate quantitatively, the effects of cross-infection control techniques on the mechanical properties of the files investigated.

M&M: Three file designs, Unifiles, Flexofile and H-File were tested to compare the values of torsional moment, torsional angular deflection, bending moment, and permanent angular deflection after being subjected to 11 different chemical and mechanical cleaning, disinfection and sterilization procedures (see JOE Dec 1996). 10 files of each type were subjected to each variation, plus ten which were tested w/out undergoing any infection-control techniques.

RESULTS: Comparing between file types, the Unifile had the highest control values for torsional moment and permanent angular deformation, and Flexofile the highest values for torsional angular deflection and bending moment. H-File had the lowest values except for permanent angular deflection, which belonged to Flexofile. This implies that Unifile is the most resistant to fracture of the three. Comparing within file groups, various ranges of change were noted in all groups after infection control measures. The largest change was seen in the H-file, having a 63% increase in the permanent angular deformation. All testing results were still within ANSI Specification 28.

C&C: It is not possible to predict the clinical performance of the files based on mechanical properties alone. This study is a well done, all encompassing mechanical evaluation of the files after disinfection and sterilization procedures. Some of the procedures, like 48 h soak in NaOCl may not be clinically relevant.

January 1997 **Robin E. Hinrichs**

Harrison JW, Johnson SA. Excisional wound healing following the use of IRM as a root-end filling material. J Endodon 1997;23:19-27.

PURPOSE: To determine the excisional would healing responses of the periradicular tissues associated with IRM as a root-end filling material and to compare these responses with those associated with amalgam and orthograde gutta-percha root-end filling materials**.**

M&M: The mandibular premolars in 10 dogs were chemomechanically prepared and obturated with gutta-percha. The root-ends were resected and assigned to 4 groups. Groups A, B, and C were prepared for root-end filling using a micro-handpiece with a #4 round bur. Group D received no further treatment and served as controls (resected to orthograde gutta-percha). Groups A and B were root-end filled with IRM. Group C was root-end filled with Tytin. Healing responses were evaluated microscopically and radiographically at postsurgical intervals of 10 and 45 days.

RESULTS: The excisional wound healing responses associated with IRM root-end fillings were normal at both postsurgical intervals. There was no evidence of inhibition of dentoalveolar or osseous wound healing associated with IRM, amalgam, or orthograde gutta-percha. Statistical analysis showed no difference in wound healing between the 3 root-end filling materials.

C&C: Woven trabecular bone was present in the excisional wound as early as 10-days postoperative. The authors noted that the smear layer was not removed on the root-ends. According to Egelberg, cementum deposition may occur on smear layered dentin or cementum, but is attached to the resected root surface only through interlocking inorganic crystals connecting the new cementum, through the smear layer, to the root surface. There is no organic locking component to support this tenuous inorganic connection.

January 1997 **Orest M. Harkacz, Sr.**

Bufflier P, Suchett-Kaye G, Morrier JJ, Benay G, Decoret D, Bonin P, Renard F, Barsotti O. In vitro evaluation of the antibacterial effects of intracanal micro plasma system treatment. J Endodon 1997;23:28-31.

PURPOSE: To evaluate and compare the individual and combined antibacterial effectiveness of Micro Plasma System (MPS) treatment and NaOCl when used in the treatment of infected canals.

M&M: 40 single-rooted teeth were instrumented to size 25 with Hedstroms and flared coronal with #2, #3, and #4 Gates Glidden drills. After autoclaving, their apices were sealed with silicone. 4 groups were infected with Actinomyces naeslundii, cultured and dried. Group one acted as controls. Group 2 received 2 MPS treatments for 30 s. Group 3 received 20µl of 0.5% NaOCl for 3 min before being recovered and rinsed with a neutralizing solution. Group 4 received a combination of NaOCl followed by MPS. All teeth were sampled again with paper points which were incubated.

RESULTS: The control group showed no reduction of CFUs. The MPS had an 81.96% reduction, the 0.5% NaOCl had a 94.90% reduction and the combination group had a 99.48% reduction in CFUs.

C&C: For MPS to work the canal humidity must be minimal. The effect of MPS is obtained by the 3000^0 C temperature obtained by the plasma arc formed on contact with the root canal walls. A pinpoint thermic effect is obtained, while the energy is directed focally and not onto the entire root canal surface. It is powered by 220V. The authors used a time of application of 30 sec, stating that any longer resulted in a rise in tooth temperature. At this point, this device is unsuitable for clinical use. There is no way to control, or even evaluate the temperature increase on the apical tissues. What if the beam was directed out a patent apex on a man molar or premolar? What effect would this have on the Inferior Alveolar Nerve? NaOCl worked better.

January 1997 **Robin E. Hinrichs**

Johnson MA, Primack PD, Loushine RJ, Craft DW. Cleaning of endodontic files, part I: the effect of bioburden on the sterilization of endodontic files. J Endodon 1997;23:32-34.

PURPOSE: To evaluate for the presence of viable organisms from endodontic files contaminated with *Bacillus stearothermophilus* in an organic bioburden and then sterilized by either steam or chemical vapor sterilization.

M&M: The bioburden utilized in the experiment consisted of *Bacillus stearothermophilus.* Ninety-two new 21 mm length #25 K-Flex files were randomly assigned into 5 groups: group A - the negative control (neither contaminated nor sterilized before culture); group B - the positive control (10 files contaminated with bioburden, not cleaned and not sterilized before culture); group C - 24 files that were contaminated with bioburden and not cleaned - 12 were steam sterilized and 12 were sterilized with chemical vapor; group D - 24 files contaminated with bioburden and then cleaned with a detergent ultrasonic cleaner (L&R Cleaner Concentrate) - 12 were steam sterilized and 12 were sterilized with chemical vapor; group E - 24 files that were contaminated with bioburden then cleaned with an enzymatic ultrasonic cleaner (Coenzyme) - 12 were steam sterilized and 12 were sterilized with chemical vapor. To create the bioburden, the files were instrumented in bovine teeth containing the bacteria for 30 s. The files were then cultured for growth, and the SEM was used to image the files at D_{16}.

RESULTS: At the 24 and 48 h periods all experimental groups (uncleaned and ultrasonically cleaned) that had been subjected to sterilization by either method produced no growth on both the agar plates and in the tubes of broth containing the files. All ten negative controls failed to produce growth in both the agar plates and the tubes of broth. All the positive controls exhibited growth on the agar plates at 2.15×10^3 cells (average of all counts) and the broth tubes were turbid indicating growth. SEM revealed the presence of debris on commercially procured files before use. This bioburden was removed by precleaning. Intentionally contaminated files that were not cleaned but sterilized showed heavy bioburden. However, these files exhibited no bacterial growth after incubation in broth or media. There was no difference between contaminated files that were not cleaned before sterilization and contaminated files that were cleaned before sterilization.

C&C: The presence of bioburden did not affect the complete sterilization of endodontic files. Steam and chemical vapor sterilizers were equally effective in sterilizing both contaminated and cleaned files. The debris remaining on endodontic files after cleaning and sterilization could present problems in altering the sharpness of the file or in the dislodgment of sterile debris in a subsequent patient.

January 1997 **Orest M. Harkacz, Sr.**

Malone KH III, Donnelly JC. An in vitro evaluation of coronal microleakage in obturated root canals without coronal restorations. J Endodon 1997;23:35-8.

PURPOSE: To evaluate whether root canal obturation with a single GP cone and either Super EBA or Ketac-Endo root canal sealer could prevent bacterial penetration through the root canal in the absence of a coronal restoration.

M&M: The palatal or distal canals of 24 extracted max or man molars were used. The other roots were sectioned off, and the orifices sealed. After preparation to 1 mm short of apical foramen, the canals were obturated with single cones w/ Ketac-Endo or Super-EBA cements. The teeth were thermocycled 300 times before experimentation. A Teflon tube into the access cavity was placed and sealed and the tooth was suspended in a Trypticase soy broth. 0.5 ml human saliva was added to each tooth daily for 60 days. Initial problems with the coronal seal of the apparatus were corrected. 4 control teeth were used, 2 positive and 2 negative.

RESULTS: All samples in the study that became turbid did so because of coronal leakage of the apparatus. No turbidity resulted from leakage through the canal.

C&C: This study had it's problems but ultimately produced reportable results. Although 60 days is short term, it seems that these obturation techniques and materials offer some resistance to coronal leakage. No mention was made of Super EBA's handling characteristics.

January 1997 **Robin E. Hinrichs**

Hosoya S, Matsushima K. Stimulation of interleukin-1β production of human dental pulp cells by Porphyromonas endodontalis lipopolysaccharide. J Endodon 1997;23:39-42.

PURPOSE: To examine IL-1β release, IL-1β converting enzyme (ICE) activity, and the IL-1β mRNA levels in human dental pulp cells treated with the lipopolysaccharide (LPS) of *Porphyromonas endodontalis.*

M&M: LPS was prepared from bacterial cultures of *Porphyromonas endodontalis.* Human dental pulp (HDP) cells were obtained from permanent, noncarious teeth extracted for orthodontic reasons. Assays were performed to determine IL-1β production, ICE activity, and the Northern-blot hybridization analysis of IL-1β mRNA in HDP cells.

RESULTS: LPS stimulated IL-1β release from HDP cells in a time- and dose-dependent manner. However, ICE activity was not increased by LPS. Northern blot hybridization analysis revealed that the IL-1β mRNA level in HDP cells was increased by LPS.

C&C: *P. endodontalis* was utilized because it is a Gram-negative bacteria isolated from infected root canals which has been detected in radicular cysts and chronic root canal inflammations, and may play a role in pulpal and periapical diseases. These results suggest that stimulation of IL-1β release from HDP cells by *P. endodontalis* LPS may have an important role in the progression of inflammation in pulpal and periapical disease. In the presence of IL-1, proliferation of resting T and B lymphocytes to growth factors is enhanced, differentiation and antibody production are augmented, and the binding of natural killer lymphocytes to their tumor targets is increased. IL-1 is also a chemoattractant for lymphocytes, and stimulates the acute-phase proteins such as complement protein (C3). IL-1β treated osteogenic cells showed significantly elevated levels of PGE, bone resorption, and osteoclast-like cell formation, as compared with nonstimulated cells. IL-1β was reported to stimulate collagenase activity in gingival fibroblasts and skin fibroblasts. In dental pulp disease, increases in levels of IL-1β in pulpitis might also stimulate inflammation.

January 1997 **Orest M. Harkacz, Sr.**

Margelos J, Eliades G, Verdelis C, Palaghias G. Interaction of calcium hydroxide with zinc oxide-eugenol type sealers: a potential clinical problem. J Endodon 1997;23:43-8.

PURPOSE: To investigate whether an interaction occurs between calcium hydroxide and zinc oxide-eugenol cement, between calcium hydroxide and zinc oxide-eugenol sealers and to preliminarily assess the calcium hydroxide removal efficiency from root canals of various agents.

M&M: A layer of zinc oxide-eugenol cement was placed on a KRS-5 crystal to enable the spectroscopic examination of the material. Spectra were recorded immediately and 5, 10, 20, and 30 min after. After cleaning, the crystal had a layer of zinc oxide-eugenol cement placed on it and then a layer of calcium hydroxide placed. Analysis was again accomplished at the same time intervals. The experiment was repeated using zinc oxide-eugenol sealers Roth 811, and Procosol. Peak absorbency ratios were used to calculate the sealer setting rates. A separate experiment designed to test the calcium hydroxide removal efficiency was set up. Irrigation w/ 2.25% NaOCl and paper point drying, irrigation with 2.25% NaOCl and use of the largest file during instrumentation, irrigation w/ 2.25% NaOCl and 15% EDTA along with the largest file, and no treatment were evaluated.

RESULTS: Calcium hydroxide preferentially interacted with eugenol inhibiting the ZnO-Eugenol chelate formation. The set zinc oxide-eugenol cement and zinc oxide-eugenol-type sealers in contact with calcium hydroxide were brittle in consistency and granular in structure. The set product contained residual eugenol. The set of the zinc oxide-eugenol cement and sealers was accelerated. None of the treatments completely removed the calcium hydroxide from root canals, but EDTA significantly reduced the extent of residual calcium hydroxide.

C&C: Anything that decreases the coronal seal is of concern. Short term implications are the increased setting action which may hinder placement of cones during obturation. Long-term implications involve the potential decrease in sealing ability of the Cavit, and long-term release of unbound eugenol. The ultrasonic was not evaluated here as to its efficiency in removal of the calcium hydroxide medicament.

January 1997 **Robin E. Hinrichs**

Baumann MA, Doll GM. Spatial reproduction of the root canal system by magnetic resonance microscopy. J Endodon 1997;23:49-51.

PURPOSE: To achieve an accurate spatial reproduction of the root canal system of extracted teeth by magnetic resonance microscopy (MRM).

M&M: Extracted teeth were placed in 10% formalin and 90% water containing a lot of protons. The teeth were imaged using MRM. Measurements were performed in a Bruker spectrometer AMX 300 WB with a 89 mm magnet (300 Mhz), 7 Tesla field strength, and a microimaging unit. The data processing was carried out by a 3D-Fourier analysis and reconstructions were done by the UXNMR (Bruker) software system. The voxel resolution isotropically reached 98 µm, so that insights into the interior of teeth on a microscopic level could be obtained.

RESULTS: The spatial reconstruction of the root canal system could be depicted in all parts from crown pulp to even small lateral canals. Within the pulp, tissue differences in its tissue texture were ascertained.

C&C: As the necessary strong magnetic fields presently are not allowed to be used in people and as the acquisition of data is costly, the noninvasive MRM technique presently can be applied only in nonclinical situations. Among the metals, only iron or nickel interfere with MR-imaging. Amalgam fillings and gold restorations in teeth do not cause any problems.

January 1997 **Orest M. Harkacz, Sr.**

Lopes MA, Spolidoria LC, Peres Line SR, de Almeida OP. Pulpal lesions in normal and cyclosporin a treated rats. J Endodon 1997;23:52-3.

PURPOSE: To examine the development of pulpal lesions in the lower molar of control and Cyclosporin A treated rats.

M&M: 40 rats, 20 immunosuppressed w/ Cyclosporin A and 20 not had pulp exposures created in all lower 1st molars. Rats were sacrificed after 7, 14, 21 and 28 days of exposure, and the tissues examined. Each of the four roots was examined.

RESULTS: Necrosis was similar in control and Cy A treated rats. Necrosis was greatest in the root closest to the pulp exposure. The pulp became progressively necrotic at each time interval (34%, 70%, 88%, and 93%).

C&C: The results indicate that Cy A, or immunosuppression in rats does not modify the defense mechanisms of their dental pulps after exposure to the oral cavity. Whether this is applicable to humans is not known.

January 1997 **Robin E. Hinrichs**

Bertrand MF, Pellegrino JC, Rocca JP, Klinghofer A, Bolla M. Removal of thermafil root canal filling material. J Endodon 1997;23:54-7.

PURPOSE: To verify if removal of Thermafil plastic carriers and reestablishment of working length were possible in single rooted canals filled with Thermafil system.

M&M: Twenty freshly extracted maxillary central incisors were prepared and filled with #30 Thermafil plastic obturators according to manufacturer's recommendations using Endobtur sealer. The access cavity was filled with IRM. After cement set (24 hours later), the teeth

were divided into 2 groups: Group I - 10 teeth were retreated using dimethylformamide as a solvent; group II - 10 teeth were retreated using chloroform as a solvent. Removal of filling material was performed manually using K files and H files alternately between carrier and dentinal walls.

RESULTS: The average time needed to remove the plastic carrier was 7 min for group I and approximately 6 1/2 min for group II. Complete removal of filling material was successful in 18 instances. No deformation of the plastic carrier was observed after removal from the canal.

C&C: The two different solvents were evaluated because the Thermafil carriers are composed of 2 different materials. Dimethylformamide is one of the components used to retreat canals filled with phenoplastic resin pastes, so its effects on the plastic portion of the Thermafil carrier was evaluated. Chloroform is known to be effective against gutta-percha, so it was evaluated for its effect on the gutta-percha portion of the carrier. In this study, when either solvent was used, the carriers were removed intact, with no deformation. No action on the plastic carrier was demonstrated when using either dimethylformamide or chloroform.

January 1997 **Orest M. Harkacz, Sr.**

O'Neal KM, Gound TG, Cohen DM. Preeruptive idiopathic coronal resorption: a case report. J Endodon 1997;23:58-9.

SUMMARY: A case report presenting a 12 caucasian male w/ an unerupted 2nd molar that had radiographic of an intracoronal radiolucency. Surgical exposure and access into the molar revealed a yellow gel-like substance with no dentin present that communicated with the pulp. The pulp appeared vital, and after curettage of the lesion, calcium hydroxide powder was placed in an apexogenesis procedure. IRM was placed as the restorative material in the access, and the flap was sutured back over the tooth. Follow-up at 3 mo, 7 mo 1 yr. and 18 months revealed a normally developing root system, but the tooth still had not completely erupted. At 18 mo, though partially erupted, the IRM was noted to be breaking down, so it was re-entered. RD isolation was not possible. The previous material in the crown was removed, and Dycal placed over the MB and ML pulp horn remnants. No hemorrhage was present. An occlusal amalgam was then placed. At 21 month posttreatment examination, the tooth was asymptomatic and responded to an EPT. C&C: An interesting case, which shows how effective apexogenesis can be when no bacteria are present.

January 1997 **Robin E. Hinrichs**

DeGrood ME, Cunningham CJ. Mandibular molar with 5 canals: report of a case. J Endodon 1997;23:60-2.
SUMMARY: A case of a mandibular molar with 5 canals is described. Literature pertaining to the analysis of the morphology of mandibular first molars is reviewed.

January 1997 **Orest M. Harkacz, Sr.**

FEBRUARY

Pruett JP, Clement DJ, Carnes DL. Cyclic fatigue testing of nickel-titanium endodontic instruments. J Endodon 1997;23:77-85.

PURPOSE: The first was to introduce a new method of determining canal curvature. The second examined the effect of cyclic fatigue in LightSpeed instruments.

M&M: 18 groups of instruments, size 30 and 40 Lightspeed, were tested in a Dynamometer at angles of curvature of 30, 45 and 60^0. Radii of curvature was either 2 or 5 mm, representing abrupt or sweeping curves respectively. Preformed stainless steel tubes at these angles were fabricated. The instruments were inserted, at speeds of 750, 1300, or 2000 rpm, and cycled till they failed. Data collection was by computer, and the cycles to failure was analyzed with respect to each of the factors: rpms, instrument size, angle of curvature and radius of curvature.

RESULTS: The 2 points of curvature are noted on the canal, and a radius of curvature that intersects both of these is determined with a circle gauge. Tangential lines drawn perpendicular to these radii intersect, and the angle of curvature is measured from there. No difference in operating rpm within the 2 groups of instrument sizes was noted. As instrument shaft diameter increased, the cycles to failure decreased. As the radius of curvature decreased, the cycles to failure decreased. Instruments in the 45 and 60^0 groups had lower cycles to failure than the 30^0 groups. Instrument separation was always within 5 min, and at the midpoint of the curve. SEM analysis showed fractures located at the point of maximum curvature in instruments cycled to ~ 80% to failure. These fractures were not visible when the instrument was not flexed, or to the naked eye when flexed. Fracture was via crack propagation until ultimately a ductile fracture occurred in the center of the file.

C&C: The new method of describing canal curvature is clinically applicable. We all knew that a sharp curve was worse than a broad sweeping one. The fact also that these instruments gave no visible sign of fracture or deformation is worrisome. It becomes inevitable that some of these instruments will separate in the canals, regardless of our replacement scheme. I agree that ANSI 28 needs revision or additions to cover the engine-driven Ni-Ti instruments.

February 1997 **Robin E. Hinrichs**

Silva LAB, Leonardo MR, Faccioli LH, Figueiredo F. Inflammatory response to calcium hydroxide based root canals sealers. J Endodon 1997 23:86-90.

PURPOSE: To evaluate the inflammatory response induced by Sealapex, CRCS, Sealer 26, and Apexit when injected into the subcutaneous tissue and peritoneal cavity of mice.

M&M: Eighty mice were divided into 4 groups, each injected with a subcutaneous suspension consisting of one of four ground set root canal sealers: group 1 - Sealapex; group 2 - CRCS; group 3 - Sealer 26; and group 4 - Apexit. Five animals were selected at random and sacrificed at 2, 4, 8, and 16 days. The injected site was then histologically evaluated. One hundred mice had the same procedure completed, but the suspension was injected intraperitoneally. A control group was injected with PBS alone. Five animals from each group were sacrificed 6 and 24 hours, and 5 and 15 days after injection. Slide smears were prepared from a peritoneal wash, and differential counts of mononuclear cells were performed.

RESULTS: *Subcutaneous tissue:* Cell kinetics were classified as initial, intermediate and late phases. During the initial phase, large amounts of PMN's were observed in response to all sealers, being more intense to CRCS and Apexit. In some cases, Sealer 26 and Sealapex caused localized tissue necrosis. CRCS and Apexit induced necrosis scattered among inflammatory cells. In the intermediate phase, there was a sharp reduction in the number of PMN's. A progressive increase in mononuclear cells occurred, varying according to the sealer tested. The late phase was characterized by few neutrophils and an intense granulomatous reaction with a predominance of epithelia cells and multinucleate giant cells (except in response to Apexit). Necrosis was noted in response to Sealer 26, CRCS, and Apexit. *Cell migration in the peritoneal cavity:* All four root canal sealers induced a significant increase in neutrophil numbers at 6 hours. Apexit induced the largest number, followed by Sealer 26. Sealapex and CRCS induced the smallest number of neutrophils. Twenty-four hours after injection, Sealapex, CRCS and Apexit induced similar neutrophilia, which was lower than that induced by Sealer 26. At five days, there was a marked decrease in neutrophil number, and by 15 days, the neutrophil numbers returned to control levels in all groups. There was no significant difference in mononuclear cell numbers detected among the sealers at any of the times tested. A significant difference in mononuclear cell number was observed only at 6 and 24 hours when comparing the four sealers to the control.

C&C: The highest cell differentiation was observed in response to Sealapex, which was attributed to the low solubility of the material and its high Ca^{2+} concentration. This is in contrast to CRCS, which does not readily release Ca^{2+}.

February 1997 **Orest M. Harkacz, Sr.**

Blum JY, Parahy E, Micallef JP. Analysis of the forces developed during obturation: warm vertical compaction. J Endodon 1997;23:91-5.

PURPOSE: To determine and display the vertical and lateral forces developed during an obturation using the warm vertical compaction technique.

M&M: 2 transducers were attached to a device containing decoronated roots that had been prepared apically to size 45. 5 endodontists and 5 dental students participated. 4 instruments, set at the orifice, halfway, and 7 and 9 mm short of root length, were used. Each operator performed 5 sessions of 4 compactions, with the computer readout of forces reviewed after each session.

RESULTS: During the 1st three sessions, the students exerted lower forces than the endodontists. During the final 2 sessions, there was no difference. The students used more compactions in the 1st 3 sessions, and had greater lateral forces in all the sessions. The endodontists averaged 2.5 ± 0.4 kg per compaction vertically, and 0.85 ± 0.2 kg in lateral forces. Endodontist always performed the final long compaction, but were unable to exert a constant force. 2 failures in obturation were discussed, and were attributed to a lack of sufficient vertical forces at the beginning of obturation.

C&C: As the authors mention, warm vertical compaction produces more vertical and lateral forces than lateral condensation. The authors were careful to assure that the pluggers did not contact the walls by presetting stops on them, but the students probably still had difficulty maintaining a vertical orientation.

February 1997 **Robin E. Hinrichs**

Ramsköld LO, Fong CD, Strömberg T. Thermal effects and antibacterial properties of energy levels required to sterilize stained root canals with an Nd:YAG laser. J Endodon 1997;23:96-100.

PURPOSE: To evaluate the use of a Nd:YAG laser for endodontic purposes with emphasis on 1) the thermal effects of intracanal lasing on the periradicular tissue, and 2) the antibacterial effects on dark-stained bacteria to establish a clinically safe level of energy introduced into the root canal.

M&M: A Nd:YAG Laser-35 was utilized at 3W (50 Hz and 60 mJ). The total energy delivered per 15-s period was 45 J. For the in vitro experiments, thermocouples were attached to the root surfaces of extracted single-rooted teeth. The canals were prepared to an ISO size #50. The fiber of a Nd:YAG laser was inserted and activated into the dry root canals. Temperature changes were recorded first during continuous lasing for 30 s and subsequently for a combination of 15 s lasing followed by a 15-s recovery interval, repeated several times. To test the antibacterial properties of laser irradiation, pure cultures of *Enterococcus faecalis* and *Streptococcus mitis* were inoculated into root canals. Twenty teeth were divided into two groups of ten teeth each. Eight teeth per group were subjected to lasing, and two were used as controls. Group 1 was lased for two 15-s periods with a 15-s recovery interval between lasings. Group 2 was lased for four 15-s intervals, with a similar recovery interval after each. Control teeth were not lased.

RESULTS: In the temperature study, a test with 30 s lasing with no recovery interval resulted in a temperature rise from 33.5 ^{0}C to 43.2^{0}C. Seven subsequent lasing intervals were performed with 15-s of lasing followed by 15-s of recovery. The first lasing interval began at 34.1^{0}C and caused a temperature increase of 6.0^0 to 40.1^{0}C. During the recovery interval the temperature dropped 3.9^0 to 36.2^{0}C. The following six lasing and recovery intervals yielded temperature peaks of 41.5 to 42.6^{0}C and lows of 36.7 to 37.1^{0}C. The results of the antibacterial tests showed that in Group 1, there was bacterial growth in samples from 6 of 8 teeth. In Group 2, there was bacterial growth in 1 of the 8 samples. All controls showed growth.

C&C: This study indicates that for the parameters under which this experiment was carried out, multiple lasings would be required to attempt to sterilize the root canal. Different results may be obtained between lasing in a wet canal vs. lasing in a dry canal. Also, the efficiency of a laser depends upon its absorption into a particular material. Therefore, different effects may also be obtained with darker vs. lighter colored dentin.

February 1997 **Orest M. Harkacz, Sr.**

Lyroudia K, Samakovitis G, Pital I, Lambrianidis T, Molyvdas I, Mikrogeorgis. 3D reconstruction of two C-shaped mandibular molars. J Endodon 1997;23:101-4.

PURPOSE: To make a computerized 3D reconstruction of C-shaped canal morphology in 2 mandibular molars.

M&M: 2 extracted man molars with c-shaped canals were embedded, sectioned in 1mm increments, and the photographic images of these sections scanned into a computer. A visual image was created of the exterior, inner surface of the pulp, and root canals.

RESULTS: It worked. The black and white photos are pretty clear. Each tooth is different with respect to the number of canals involved in the C, and the number of foramen.

C&C: Color photos are probably even better. This would make a good teaching tool, especially if models of these teeth were fabricated with an incredibly expensive machine.

February 1997 **Robin E. Hinrichs**

Bilginer S, Esener IT, Söylemezoglu F, Tiftik AM. The investigation of biocompatibility and apical microleakage of tricalcium phosphate based root canal sealers. J Endodon 1997;23:105-9.

PURPOSE: To determine the biocompatibility and apical sealing ability of α-tricalcium phosphate based Sankin Apatite (SA) Type I, Type II, and Type III root canal sealers.

M&M: *Biocompatibility study* - 140 sterile teflon tubes, 10 mm long and 1.3 mm in internal diameter, were filled flush with freshly mixed SA Type I, Type II, and Type III, or Grossman's Cement (GC) and implanted into the subcutaneous connective tissue of 31 mice. Twelve empty tubes were implanted in 3 mice as controls. At the end of the experimental period (24 h, 7, and 30 days), the animals were sacrificed and the implants along with surrounding tissue were prepared for histologic evaluation. *Apical leakage study* - 54 single straight canaled human teeth were prepared to a minimum size #45 with step-back flaring. Five teeth were obturated with lateral condensation using gutta-percha and no sealer (positive control). Five unfilled teeth were completely coated with sticky wax (negative control). The remaining teeth were obturated using lateral condensation of gutta-percha and SA Type I, Type II, Type III, or GC sealer. The cervical portion of the roots were covered with sticky wax, and the teeth were allowed to set for 48 h, after which they were immersed in 2% methylene blue dye for 48 h. The apical root end of each tooth was then cut off until the tip of the gutta-percha was visible (to eliminate dye in the delta area of the apex). Leakage was quantitatively measured by dissolving the roots in nitric acid and analyzing the resulting solution with a spectrophotometer to determine the concentration of methylene blue dye in the solution.

RESULTS: *Biocompatibility* - At the end of 24-h, SA Type II, Type III, and the control had a mild acute inflammatory reaction. A mild/moderate inflammatory response was observed in SA Type I, and a moderate acute inflammatory reaction was found in GC. After 7 days, a mild/moderate inflammatory response with intensive PMN's and many lymphocytes, macrophages and plasma cells was observed with SA Type II and III specimens. A moderate inflammatory response was observed with Type I and control specimens, with half the Type I specimens exhibiting necrosis. GC specimens yielded a moderate/severe inflammatory response. All specimens at day 7 had a fibrous capsule around them. After 30 days, all reactions were of a chronic nature. SA Type I, II, and III specimens had a mild/moderate inflammatory

response, GC specimens yielded a moderate inflammatory response, and controls yielded a mild inflammatory response. Type I had a less mature fibrous capsule compared to the remaining specimens. *Apical leakage* - No significant difference in spectrophotometrically measured leakage was noted among the teeth obturated with the test materials.

C&C: According to the authors, SA Type II and III contain iodoform, and were found more biocompatible than Type I and GC. In general, all the sealers had minimal dye leakage under the design of this experiment. The article evaluated the 3 different types of Sankin Apatite sealers, which differed in chemical composition, but no information was given as to what purpose or situation each type of formulation was designed for. According to the authors, the severity of the reaction among the tested materials decreased with time.

February 1997 **Orest M. Harkacz, Sr.**

Vigil GV, Wayman BE, Dazey SE, Fowler CB, Bradley DV. Identification and antibiotic sensitivity of bacteria isolated from periapical lesions. J Endodon 1997;23:110-4.

PURPOSE: To further characterize the type and antibiotic sensitivity of bacteria isolated from periapical lesions refractory to nonsurgical endodontic therapy.

M&M: 30 periradicular lesions were collected during surgery after conventional endodontics had failed to resolve the conditions. The tissue was washed 3 times and divided in half. Half was sent for microscopic analysis, and half was placed in Reduced Transport Fluid and submitted for culture. Bacteria that were cultured were identified, and sensitivity and specificity was determined.

RESULTS: 2 specimens were discarded because of breaks in protocol. 21% of the specimens (6) showed no growth. 2 of these 6 had been on antibiotics for 1 wk prior to surgery. The most common isolates were *Propionibacterium acnes, Staphylococcus epidermidis*, and *Streptococcus intermedius*. 10 of the 15 lesions with no visible oral communication yielded mixed cultures, averaging 2.3 isolates each. 12 of the 13 with possible communication yielded positive culture growth. 9 were polymicrobial, averaging 2.5 per case. The most common isolates were *Wolinella recta, Fusobacterium,* and *Clostridium* species. In nearly all cases of growth there was a mix of obligate *and* facultative MO's, and the other half had obligate *or* facultative specimens. 93% were granulomas, 7% were cysts. Foreign matter was seen in 25%. Antibiotic resistance was common, although not considered significant.

C&C: A good study, but the numbers are low. More specimens might have increased the number of *Bacteriodes*, as the authors suggest.

February 1997 **Robin E. Hinrichs**

Kamal AMM, Okiji T, Kawashima N, Suda H. Defense responses of dentin/pulp complex to experimentally induced caries in rat molars: an immunohistochemical study on kinetics of pulpal Ia antigen-expressing cells and macrophages. J Endodon 1997;23:115-20.

PURPOSE: To examine the distributional and numerical changes of Ia antigen-expressing cells following varying periods of caries induction.

M&M: *Streptococcus mutans* was utilized to induce caries in pathogen-free rats. Control animals were not inoculated. Periods of caries induction were set at 8, 12, and 16 wks. At the given periods, the animals were sacrificed and prepared for histologic sections using HE and immunoperoxidase staining. Mouse antirat monoclonal antibodies ED1 (anti macrophages and dendritic cells), ED2 (anti tissue macrophages), and OX6 (anti Ia antigen) were used as the primary antibodies in the immunoperoxidase staining.

RESULTS: Dentinal caries of various depths, both proximal and occlusal, developed in almost all molar teeth. No detectable caries were observed in the controls. Caries depth increased with the period of caries induction. Teeth with deep caries usually displayed a more extensive inflammatory cell infiltration compared with those with the superficial caries. In the control teeth from every period, ED1+ and ED2+ cells displayed a relatively random distribution throughout the entire pulp, while OX6+ cells usually concentrated in and around the odontoblastic layer of the coronal pulp. In the carious teeth, cells positive to each antibody tended to increase their density in the coronal pulp. Quantitative assessment of the positively stained cells in the coronal pulp at each interval revealed that ED1+ , ED2+, and OX6+ cells in the experimental group significantly increased compared to the corresponding controls. OX6+ cells showed a prominent increase at 8 weeks. At 16 weeks, ED2+ cells were the most prominent.

C&C: The kinetics of the above experiment reveals that the initial pulpal response was characterized by a localized accumulation of Ia antigen-expressing cells beneath the dentinal tubules communicating with the superficial caries. This was followed by a caries-depth related increase of Ia antigen-expressing cells and macrophages in the coronal pulp (this was most apparent when the caries had progressed into the reparative dentin). According to the authors, this suggests that the response of Ia antigen-expressing cells to carious irritants triggers the defense reactions of the pulp. They speculated that the intensity of the defense reactions may be correlated with the permeability of the carious dentin. The data also indicate that the depth of the caries is more critical than the period of caries induction in eliciting the inflammatory reaction of the pulp.

February 1997 **Orest M. Harkacz, Sr.**

Sumi Y, Hattori H, Hayashi K, Ueda M. Titanium-inlay - A new root-end filling material. J Endodon 1997;23:121-3.

PURPOSE: To present a "new" material and technique for root-end fillings.

SUMMARY: Titanium inlays were prefabricated in 3 sizes, corresponding to the ultrasonic tip sizes. After preparation of the root end, the appropriate inlay is cemented with SuperEBA cement. This decreases the amount of Super EBA exposed to the periradicular tissues, decreasing its cytotoxic effects. 108 teeth in 48 patients were presented, w/ follow-up for up to on year, but most were only 6 mo. No problems were noted in any.

C&C: Besides the obviously short follow-up period, why do this at all? Another element is added to the procedure, complicating it. The biggest concern I have is the treatment of fins and isthmi. In the root-end preparation shown, the isthmus was not prepared. My concern is that the preparation for the inlay will override the removal of all possible sources of leakage. Maybe a titanium cement could be developed.

February 1997 **Robin E. Hinrichs**

Alexander JB, Carnes DL, Gilles JA. A comparison of clinical root canal therapy performed by third-year dental students using Canal Master instruments to that performed using K-files. J Endodon 1997;23:124-8.

PURPOSE: To radiographically compare clinical root canal therapy performed on the mesial roots of mandibular molars by third-year dental students during an academic year when all instrumentation was performed with K-files to that performed the subsequent year by third-year students using the Canal Master (CM) system. This was done to determine if improvement previously seen in a nonclinical comparison would be demonstrated in clinical cases.

M&M: Sixty-nine K-file and 52 CM cases of lower molar root canal therapy performed by third-year dental students were evaluated. Obturation in all cases was accomplished using laterally condensed gutta-percha. Periapical radiographs (preoperative, length determination, condensation, and postoperative views) were evaluated by a panel of 5 endodontists under 10x magnification who rated the quality of the root canal therapy by maintenance of length during instrumentation, maintenance of original canal shape, instrumentation to adequate size, and quality of fill to working length without voids.

RESULTS: *Length maintenance* - Maintenance of length during instrumentation with CM instruments was rated significantly better than with K-files by 2 evaluators. No significant differences between the two techniques were noted by the remaining evaluators. *Original shape of canal maintained* - Four evaluators rated the CM significantly better compared to the K-file in maintaining canal shape. The remaining evaluator rated the CM better, though statistical significance was not achieved. *Canal instrumented to adequate size* - Three evaluators rated the CM significantly better that K-files. *Fill to working length without voids* - Three evaluators indicated significant improvement in fill quality of CM cases compared to K-file cases. No significant difference was indicated for the ratings of the other two evaluators. *Final score* - The median score for the CM cases was significantly higher than the median score for the K-file cases.

C&C: No evaluator rated any category significantly better with the use of K-files. Variables to consider: no standardized method of film placement (angulations could vary from film to film), how did the evaluators determine that enlargement was sufficient to clean the canal of pulpal tissue from radiographs, the instrumentation techniques were not comparable (they compared a filing vs. a rotational technique). As an aside, the incidence of instrument separation was greater with the CM than K-files, most likely due to the instrumentation techniques involved.

February 1997 **Orest M. Harkacz, Sr.**

Malagnino, V, Gallottini L, Passariello P. Some unusual clinical cases on root anatomy of permanent maxillary molars. J Endodon 1997;23:127-8.

PURPOSE: To present 3 cases of unusual anatomy in maxillary molars.

SUMMARY: 3 max molars, two seconds and one first were presented. The MB and DB canals merged to one and exited with a common foramen. The authors called the resultant fill an inverted Y effect. Working length radiographs should alert the practitioner, who can then take appropriate measures during preparation and obturation.

February 1997 **Robin E. Hinrichs**

MARCH

Tepel J, Schäfer E, Hoppe W. Properties of endodontic hand instruments used in rotary motion. Part 3. Resistance to bending and fracture. J Endodon 1997;23:141-5.

PURPOSE: To evaluate the bending and the resistance to fracture of nickel-titanium K-files, titanium-aluminium K-files and reamers, stainless steel K-files and reamers, and flexible stainless steel instruments according to ISO 3630-1.

M&M: Resistance to bending and resistance to fracture were determined with a testing apparatus corresponding to ISO 3630-1. The following root canal instruments were tested: (a) nickel-titanium K-files (made by two manufacturers), (b) titanium-aluminium K-files and reamers (Microtitane instruments made by one manufacturer), (c) conventional stainless steel instruments (K-files and reamers made by 7 manufacturers), (d) flexible stainless steel instruments (5 instruments made by 4 manufacturers). Instrument sizes #15, 25 and 35 were tested, with ten instruments for each type and size.

RESULTS: None of the instruments exceeded the maximum bending moments given in ISO 3630-1. In ascending order of bending moment the instruments ranked: nickel-titanium K-files, titanium-aluminium K-files and reamers, flexible stainless steel instruments, conventional stainless steel K-files and reamers. Nickel-titanium, titanium-aluminium, and flexible stainless steel instruments displayed lower torque values than conventional stainless steel K-files and reamers. Conventional stainless steel K-files and reamers showed about the same torque. In most cases, K-files reached greater angular deflection than reamers of the same brand.

C&C: None of the instruments tested fractured after a 180^0 rotation. Except for nickel-titanium instruments, visible nonelastic deformation occurred before fracture, which lead to an obvious unwinding of the twisted instruments.

March 1997 **Orest M. Harkacz, Sr.**

Yared GM, Dagher FB, Machtou P. Influence of the removal of coronal gutta-percha on the seal of root canal obturations. J Endodon 1997;23:146-8.

PURPOSE: To use the fluid filtration technique to compare the quality of the coronal seal of cold lateral and warm vertical condensation in coronal unsealed root canals.

M&M: 100 teeth were decoronated to uniform root length, and prepared to a size 30 apically. WL was .5 mm short of the apical foramen. Flaring was accomplished, and heat carriers were adjusted so that they penetrated no more than to the apical 10 mm of GP. Teeth were obturated using GP and Kerrs Pulp Canal Sealer. Groups 1 and 2 had vertical and lateral condensation respectively, with GP removed by heat only. Groups 3 and 4 had vertical condensation respectively, and GP removed by heat alternated with compaction of the heat softened GP. After 30 min, teeth were tested in the Pashley device at 1.5h, 1 d, and 1, 4, 12, 18, and 24 wk after obturation.

RESULTS: Groups 2 and 4 showed significantly more leakage at 24 wk than at 18 wk. Coronal leakage did not significantly increase in groups 1 and 3 over the same period.

C&C: There was a trend toward increased leakage with time in all groups, which is disturbing. Anytime heat is used in the canal, either during obturation or removal of GP, it behooves us to vertically compact the softened mass to help counter the expected shrinkage of the warm GP.

March 1997 **Robin E. Hinrichs**

Reeh ES, Combe EC. A new single-step technique for apical retrofilling that significantly reduces microleakage. J Endodon 1997;23:149-51.

PURPOSE: To ascertain the suitability of polyacrylic acid (PAA) as a dentin bonding agent for use in apical retrofillings and to establish if bonding could reduce the microleakage of retrofillings.

M&M: 60 single-canaled roots were divided into 6 groups of ten. After mounting the teeth in acrylic resin with the roots exposed, 2 to 3 mm of the apical ends of the roots were sectioned off perpendicular to the long axis of the root. Retropreparations were cut in each root to a depth of 2 to 3 mm with ultrasonics. The six groups were retrofilled in random order with the following materials being used: EBA (Group I), amalgam (Group II), Durelon (Group III), Durelon with the application of extra PAA to condition the dentin (Group IV), Glass-ionomer (Group V), and EBA/PAA (Group VI). Leakage was evaluated by coating the teeth with nail varnish, immersing them in methylene blue dye for 72 hours, then sectioning them along their long axis and measuring the leakage with 20x magnification.

RESULTS: The experimental data for Groups I, II, III, and IV were not continuous, i.e. the dye had penetrated beyond the floor of the retropreparation in one or more samples. The data for Groups V and VI were continuous. The mean depths of dye penetration for these groups were: Group V, 1.48 ± 0.58 mm, and Group VI, 1.32 ± 0.48 mm, which were not significantly different.

C&C: The impression given was that the cements were evaluated immediately after root-end filling (no delay to allow set of material). Leakage of EBA appeared to have been reduced when the dentin was pretreated with an aqueous solution of PAA. Application of PAA to Durelon did not improve the seal of the material. Seal with glass ionomer and EBA/PAA were similar. No long term immersion was accomplished. Preps should have been standardized to either 2 or 3 mm, not 2 to 3 mm (variability of 1 mm can throw off readings and influence leakage).

March 1997 **Orest M. Harkacz, Sr.**

Todd WM, Kafrawy AH, Newton CW, Brown CE. Immunohistochemical study of gamma-aminobutyric acid and bombesin/gastrin releasing peptide in human dental pulp. J Endodon 1997;23:152;7.

PURPOSE: To investigate the presence of the putative peripheral neuromodulators GABA and BN/GRP in the human tooth pulp.

M&M: 31 teeth, 15 normal and 15 carious were used. Criteria included evidence of carious involvement, lack of symptoms on day of surgery, and absence of evidence, both clinical or radiographic of periapical pathosis. Teeth had their apical half of the root removed upon extraction to facilitate fixation. Sections were decalcified and were stained for GABA and BN/GRP.

RESULTS: Pulpal staining for GABA-L1 was 0.92 for the normal, and 1.84 for the carious teeth. Dentinal staining for GABA-L1 showed means of 0.38 and 0.99 for normal and carious teeth respectively. Pulpal staining for BN/GRP-L1 was 0.77 and 1.42 for normal and carious teeth respectively. Dentinal staining for BN/GRP-L1 was virtually nil for normal teeth, and light for the carious group, 0.02 and 0.61 respectively. There was significant correlation between caries penetration and pulpal inflammation, and between GABA-L1 levels and the degree of pulpal inflammation.

C&C: GABA is the main inhibitory neurotransmitter w/in the CNS. Receptors have also been found on A-delta and C-fiber afferent axons. The theory of GABA as a peripheral neuromodulator may help explain the observation that pain is an infrequent or late sequelae to caries or pulpal pathosis. Possibly the bacteria are producing the GABA, keeping symptoms down and aiding its progression.

March 1997 **Robin E. Hinrichs**

Snyder WR, Hoover J, KhourymR, Farach-Carson MC. Effect of agents used in perforation repair on osteoblastic cells. J Endodon 1997;23:158-61.

PURPOSE: To examine the osteoblastic responses to several different dental materials.

M&M: The bone-forming activity of osteoblasts was assessed by measuring the steady-state mRNA levels encoding for two noncollagenous bone matrix proteins, osteopontin (OPN) and osteocalcin (OCN). Materials evaluated included: GC Dentin Cement, Super-EBA, Roth Root Canal Cement, Amalgam Valiant Ph.D., Ketac Endo, IRM, Cavit-G and Ketac Bond. Mixed samples were stored in sterile water for 10 days to extract water-soluble components. The extracts were added to a medium of osteoblastic ROS 17/2.8 cells and cultured for 48 hours. The negative control consisted of vehicle-treated culture in which 100 µl of sterile water treated in parallel with the study samples was added to the cells. In the positive control, 1,25-dihydroxyvitamin D_3 was added to the cells at the start of the incubation period. After 48 hours, total RNA was extracted and analyzed with specific radiolabeled cDNA probes using Northern blotting to measure mRNA levels of OPN and OCN. mRNA levels in treated samples were compared with controls. Blots were exposed to autoradiographic film for varying periods of time ranging 1-14 days, and band intensity corresponding to mRNA levels encoding OPN and OCN on developed films was quantitated using a densitometer.

RESULTS: No material tested was grossly cytotoxic to the osteoblastic cells by visual assessment, including disruption of focal adhesions, cell morphology, or cell number. All exposed films of mRNA extracts from cells treated with 1,25-dihydroxyvitamin D_3 showed OPN and OCN mRNA levels significantly higher than any of the samples or controls. For OCN, the mean levels of mRNA after treatment with Ketac Endo, IRM, Cavit-G, and Ketac Bond were higher than the mRNA levels of the vehicle control. Cavit-G consistently produced nearly a 2-fold stimulation of mRNA accumulation for OCN in both experiments. The Valiant Ph.D. samples expressed levels of mRNA-encoding OCN that were significantly lower than that of the vehicle control. All of the differences noted were small in magnitude compared to the positive stimulator, 1,25-dihydroxyvitamin D_3, which produced a 6-fold induction of mRNA level. For OPN, the mean levels of mRNA after treatment with Ketac Endo, IRM, and Cavit-G were substantially higher than the mRNA levels of the vehicle-treated control. There were no samples that showed significantly lower levels of expressed OPN mRNA than the vehicle control, although several demonstrated little if any effect on OPN biosynthesis. Ketac Endo produced a significant (2-fold) stimulation of OPN mRNA levels in both experiments.

C&C: The bottom line is that the materials used in perforation repair currently may produce small, measurable effects on osteoblastic responses. Valiant Ph.D. may have a negative effect on osteoblastic response.

March 1997 **Orest M. Harkacz, Sr.**

Yoshikawa MY, Hayami S, Tsuji I, Toda T. Histopathological study of a newly developed root canal sealer containing tetracalcium-dicalcium phosphates and 1.0% chondroitin sulfate. J Endodon 1997;23:162;6.

PURPOSE: To compare the biocompatibility and healing ability of newly developed sealers and to estimate the participation of these sealers in the periapical wound healing.

M&M: 2 new sealers, TDM and TDM-S were compared to a known sealer Apatite Root Sealer (ARS). TDM and TDM-S both contain dibasic calcium phosphates and tetracalcium phosphate. The TDM-S also contains chondroitin sulfate. All three material were placed subcutaneously in rat backs, and in prepared rat 1st molar canals. Observation periods were from 1 - 4 wks.

RESULTS: There were no inflammatory reactions in the tissue to TDM implants at any time periods. Infiltrated collagenous tissue and capillaries were observed at 3 and 4 wks. The TDM-S implants showed no acute inflammation, but multinucleated giant cells and macrophages were observed around the implants. A large area of necrosis was observed around the ARS implant. Periapical reaction was similar. The TDM treated canals showed no inflammation, and occasional cementum-like deposition was seen apically. The TDM-S had a small number of PMNs periapically, with macrophages and giant cells present early. Osteoblasts were observed, but no hard tissue deposition was seen. There was encapsulation of the apical foramen with a layer of fibrous connective tissue. The ARS showed severe acute inflammatory reactions, with resorption of periapical alveolar bone in some specimens.

C&C: The addition of chondroitin-sulfate did not enhance the non-toxic response of the sealer. The dicalcium phosphate dihydrate converts to hydroxy apatite and has the ability of self-setting in a short time at room temperature. This material shows some promise, but many more factors need to be studied. A sealer that promotes bony repair would be highly sought after.

March 1997 **Robin E. Hinrichs**

Siqueira JF, de Uzeda M. Intracanal medicaments: evaluation of the antibacterial effects of chlorhexidine, metronidazole, and calcium hydroxide associated with three vehicles. J Endodon 1997;23:167-9.

PURPOSE: To compare the antibacterial activity of chlorhexidine, metronidazole, and calcium hydroxide mixed with different vehicles against bacterial species commonly isolated from infected root canals.

M&M: Antibacterial activities of the medicaments were evaluated against obligate and facultative anaerobic bacteria. Medicaments included: (a) calcium hydroxide powder mixed with distilled water, (b) calcium hydroxide powder mixed with CPMC, (c) calcium hydroxide powder mixed with glycerin, (d) chlorhexidine digluconate 0.12% gel, and (e) metronidazole 10% gel. The obligate anaerobes consisted of: *Porphyromonas endodontalis, Porphyromonas gingivalis, Actinomyces israelii, Fusobacterium nucleatum, Propionibacterium acnes,* and *Campylobacter rectus.* The facultative anaerobes used were: *Staphylococcus aureus, Streptococcus mutans, Streptococcus sanguis, Streptococcus salivarius, Enterococcus faecalis,* and *Actinomyces viscosus.* The agar diffusion test was used where wells of 5 mm depth and 6 mm diameter were punched in agar plates and filled with the medicaments to be tested. Metronidazole was tested against the obligate anaerobic bacteria only. Positive control plates were streaked with bacteria, but no medicament was used. Zones of inhibition were measured after 7 days.

RESULTS: Calcium hydroxide mixed with CPMC showed large zones of inhibition against all bacterial strains tested. Chlorhexidine 0.12% was also inhibitory against all strains, but on the whole it was not more effective than calcium hydroxide with CPMC. Metronidazole was effective against all obligate anaerobes tested (it was more effective that calcium hydroxide and CPMC only against *P. endodontalis* and *F. nucleatum).* Calcium hydroxide mixed with distilled water or glycerin was ineffective against all bacterial strains used in this experiment.

C&C: They should have included a group evaluating only CPMC to determine if it alone is the effective medicament, or if it is the mixture of calcium hydroxide with this material which makes it so effective. Calcium hydroxide plus CPMC yields calcium paramonochlorophenolate, which is a weak salt that progressively releases paramonochlorophenol (PMC) and hydroxyl ions to the surrounding medium. Released PMC may be responsible for the zones of inhibition seen in the study.

March 1997 **Orest M. Harkacz, Sr.**

Tucker DM, Wenckus CS, Bentkover SK. Canal wall planning by engine-driven nickel-titanium instruments, compared with stainless steel hand instrumentation. J Endodon 1997;23:170-3.

PURPOSE: To quantify canal wall planing achieved by hand instrumentation using stainless-steel files, compare with engine-driven nickel-titanium files in curved canals.

M&M: 30 mesial roots were used, the ML canal being the experimental canal, and the MB canal the control. Half were instrumented using Flexofiles in a precurved, anticurvature step-back filing method to an apical size 30. NT sensor files in a NiTiMatic system were used to an apical prep size of 40, then flared. Teeth were sectioned at ~1.0, 2.5 and 5.0 mm from the working length, ground, polished and stained. The mean percentage of canal wall planing was determined.

RESULTS: For the hand instrumentation group, the mean percentage apically was 77.2%, middle level was 81.2%, and coronal level was 76.9%. For the NiTi group, the same levels were 82.7, 79.9, and 62.8%. There was no significant differences between the 2 groups at any of the three levels. Overall, the difference between groups was also not significant.

C&C: The authors note that round canals were planed better, and that canals w/ fins were at best only planed 80%. 66% of the teeth had isthmi or excessively prolonged fins in at least one level. Communications frequently alternated from one level to the next. Canal transportation toward the furca was seen with both methods, but instrumentation to the CDJ occurred only in several sections of the hand filing group. Hand filing apparently had greater apical debris extrusion. The importance of irrigation and intracanal medicaments cannot be overemphasized.

March 1997 **Robin E. Hinrichs**

Goodell GG, Mork TO, Hutter JW, Nicoll BK. Linear dye penetration of a calcium phosphate cement apical barrier. J Endodon 1997;23:174-7.

PURPOSE: To compare linear dye penetration in teeth with open apices obturated with or without immediately placed apical barriers of calcium phosphate cement.

M&M: A #90 file was extended 1 mm beyond the apex of 42 single-rooted, single-canaled teeth. Forty of the roots were then randomly assigned to 2 groups. In group 1, 20 roots received 2 mm thick apical plugs of calcium phosphate cement (CPC) followed by obturation with custom-fitted, laterally condensed gutta-percha and sealer. In group 2, 20 roots were obturated in the same manner without apical plugs of CPC. The two remaining roots served as controls (positive and negative). Teeth were allowed to set for 48 hours at room temperature, then covered with nail polish, and immersed in India ink for 48 hours. The roots were then split longitudinally, and leakage was measured with 10x magnification.

RESULTS: The roots with apical CPC barriers demonstrated less dye penetration along the gutta-percha with a mean of 0.12 mm compared to a mean of 5.86 mm for roots without apical barriers. Roots with apical CPC barriers also showed less maximum extent of dye penetration with a mean of 2.88 mm compared to a mean of 7.16 mm for roots without apical barriers. The positive control demonstrated total dye penetration and the negative control showed no dye leakage.

C&C: Dye penetration typically stopped at the CPC-gutta percha interface.

March 1997 **Orest M. Harkacz, Sr.**

Dagher FB, Yared GM, Machtou P. An evaluation of 2% lidocaine with different concentrations of epinephrine for inferior alveolar nerve block. J Endodon 1997;23:178-80.

PURPOSE: To measure the degree of anesthesia obtained with 2% lidocaine with different concentrations of epinephrine: 1:50,000, 1:80,000, and 1:100,000.

M&M: 30 subjects received 1.8 ml of each solution 1 week apart, in a double blind study format. Anesthesia was checked initially, then every 3 min up to 50 min.

RESULTS: There were no significant differences between groups with respect to incidence of pulpal anesthesia, anesthetic failure, slow onset, non-continuous anesthesia, or short duration anesthesia.

C&C: Although not significant, it is interesting that the 1:80,000 concentration of lidocaine did better in nearly every category of each tooth tested. Perhaps it's pH is slightly different, or there is a good balance in the amount of stasis caused by the epinephrine, and its ability to still travel through the tissues.

March 1997 **Robin E. Hinrichs**

Ehrich DG, Lundgren JP, Dionne RA, Nicoll BK, Hutter JW. Comparison of triazolam, diazepam, and placebo as outpatient oral premedication for endodontic patients. J Endodon 1997;23:181-4.

PURPOSE: To compare oral premedication with 0.25 mg of triazolam, 5 mg of diazepam, or placebo administered in a double-blind fashion to patients undergoing endodontic treatment.

M&M: 79 endodontic patients with heightened anxiety were evaluated in the study. The patients received oral formulations of triazolam (0.25 mg), diazepam (5 mg), or placebo. The Digit Symbol Substitution Test (DSST) was used to measure cognitive function, and vertical and horizontal visual analogue scales (VVAS and HVAS) were used to measure anxiety. To evaluate memory impairment, the patient was shown the first of 7 simple drawings of common items, such as a chair or clock. The tests were administered before, during and after endodontic treatment. Patients were evaluated for a 24 hour postoperative recall.

RESULTS: In comparison with diazepam and placebo, triazolam was significantly better for decreased anxiety, impaired cognitive function, patients' rating of drug effectiveness, and amnesia to clinical events and pictures. Diazepam showed similar trends compared with placebo, but to a lesser degree. Diazepam also had a longer recovery period. No significantly adverse side effects were seen in any patient either during or after the procedure. At the follow-up telephone interview 24 hours later, six patients from the triazolam group reported symptoms of tiredness and 3 reported lightheadedness or dizziness the evening after the procedure.

C&C: Triazolam in this study was a more effective anxiolytic than diazepam for endodontic patients.

March 1997 **Orest M. Harkacz, Sr.**

Walvekar SV, Behbehani JM. Three root canals and dens formation in a maxillary lateral incisor: A case report. J Endodon 1997;23:185-6.

SUMMARY: A 19 yo presented for tx of a max right lateral. The tooth was discolored and non-responsive to pulpal testing. Apical tenderness to palpation was present, as was a large periapical radiolucency. The radiograph also revealed a dens invaginatus. Two main canals were treated, and what appears to be the dens connective tissue was also accessed.

C&C: This appears to be an Ohlers Class III dens invaginatus. The dens seems to bisect the main canal, forming the 2 canals that were instrumented well. The 3rd canal in the middle is in the dens and is lined w/ enamel, severely limiting its ability to be instrumented.

March 1997 **Robin E. Hinrichs**

Goswami M, Chandra S, Chandra S, Singh S. Mandibular premolar with two roots. J Endodon 1997;23:187.

SUMMARY: A case is presented of a mandibular second premolar with two roots branching in a mesiodistal direction. The condition was bilateral. This case is unique in that bifurcation of the roots among lower premolars usually occurs buccolingually.

March 1997 **Orest M. Harkacz, Sr.**

APRIL

Goodis H, Saeki K. Identification of Bradykinin, substance P, and neurokinin A in human dental pulp. J Endodon 1997;23:201-4.

PURPOSE: To develop a methodology for the identification of inflammatory mediators such as bradykinin (B) and neurotransmitters such as substance P (SP) and neurokinin A(NA) in the dental pulp.

M&M: Pulp tissue from 40 unerupted 3rd molars was extracted and homogenized with acetic acid. The molars were immediately placed in liquid nitrogen upon extraction to halt any tissue enzyme activity. Known amounts of the three substances were added to this pulp tissue, and to bovine serum albumin (BSA), and analyzed using high performance liquid chromatography (HPLC). Some prepared pulp was analyzed without the addition of the known quantities.

RESULTS: The amounts recovered from the spiked pulp and the BSA were similar, with B having the greatest amount recovered. B, SP, and NA were also recovered from the non-spiked pulp, in roughly the same, but smaller proportions. The results were quantifiable

C&C: These substances occur naturally in the pulp, and the authors would like to be able to quantify any changes in their amount due to inflammation and its role. They desire to assess the neurovascular changes and inflammation occurring in the dental pulps of teeth exposed to external stimuli.

April 1997 **Robin E. Hinrichs**

Segura JJ, Calvo JR, Guerrero JM, Jimenez-Planas A, Sampedro C, Llamas R. EDTA inhibits in vitro substrate adherence capacity of macrophages: endodontic implications. J Endodon 1997;23:205-8.

PURPOSE: To investigate the effect of EDTA on substrate adherence capacity of rat inflammatory macrophages to determine if EDTA leakage to periapical tissues during root canal therapy can alter macrophage function.

M&M: Casein was used to elicit inflammatory macrophages in rats, which were then obtained and used in substrate adherence assays. The adherence index (AI) was calculated.

RESULTS: EDTA inhibited the substrate adherence capacity of macrophages in all conditions tested. The inhibitory effect of EDTA was a time-dependent and dose-dependent phenomenon. Higher EDTA concentrations decreased the AI significantly at all times tested.

C&C: According to the results, the lowest EDTA concentration that caused significant inhibition of AI was 50 mM. EDTA concentrations ranging from 50 mM to 200 mM can be found in periapical tissues as a result of EDTA leakage during root canal preparations. According to the authors, EDTA's inhibitory effect depends on its chelating action on calcium ions. It is possible that apical leakage of EDTA could reduce macrophage adhesion, thus inhibiting phagocytic function and antigen presentation.

April 1997 **Orest M. Harkacz, Sr.**

Lee CQ, Harandi L, Cobb CM. Evaluation of glass ionomer as an endodontic sealant: An in vitro study. J Endodon 1997;23:209-12.

PURPOSE: Phase one evaluated the interaction of the GP cone with either Grossman's or Ketac Endo sealer. Phase two was performed to determine the adequacy of the seals produced by the glass ionomer sealer with one gutta percha cone.

M&M: Phase one: 20 tubes were half-filled with sealer, 10 with Grossman's, 10 with Ketac Endo, and had a 50 GP cone placed. After 1 wk, the tube and sealer was removed from the cone and it was analyzed with a SEM. Phase two: 4 groups of 10 teeth were obturated with Ketac Endo and with multiple GP cones, Ketac Endo and a single GP cone, Grossman's sealer and multiple cones, and Grossman's with a single cone. Leakage was evaluated with 1% methylene blue dye.

RESULTS: Phase one: Grossman's cement seemed tightly bound to the GP cone. There was no evidence of any extensive physical bonding between the GP and glass ionomer. Phase two: Ketac Endo in the single cone technique leaked the most, with a mean of 4.3 mm leakage. Next was Grossman's with a single cone at 1.00 mm, then Ketac Endo with lateral condensation at .81 mm. The least leakage occurred with Grossman's and multiple cones in a lateral condensation technique. The three lesser leakage groups are all statistically equivalent.

C&C: The authors don't mention the manipulation characteristics of the Ketac Endo sealer with the lateral condensation technique. I am not sure what inherent advantages the authors are referring to when they say that glass ionomer may be preferable to Grossman's in a lateral condensation technique.

April 1997 **Robin E. Hinrichs**

Ninomiya J, Nakanishi K, Takemoto T, Higashi T, Ogawa T, Kawaguchi H, Yoshino H, Hirakawa M, Shiba H, Hino F, Shibata K, Hino T. Cellular immuno-competence of infected root canal contents in pathogenesis of periapical lesions. J Endodon 1997;23:213-6.

PURPOSE: To clarify the role of cellular immunity in the pathogenesis of periapical lesions.

M&M: Soluble fractions of infected root canal contents (IRCC) were collected from about 300 human extracted teeth and utilized for in vivo chemotactic assays, determining cellular immune responses to IRCC, and evaluating chemotaxis of spleen cell culture supernatants.

RESULTS: 1. *In vivo chemotactic assay* - Compared with the samples collected after thorough mechanical debridement of stimulants from the infected root canals, IRCC showed leukocyte chemotaxis, which was markedly concentration-dependent. The migrating leukocytes were mostly PMNL; the proportionate accounted for MNC (mononuclear cells) was very low. 2. *Chemotaxis of spleen cell culture supernatant* - The culture supernatant derived from culturing the spleen cells of an IRCC-sensitized animal with IRCC was found to produce mononuclear cell (MNC) chemotaxis.

C&C: None

April 1997 **Orest M. Harkacz, Sr.**

Wolcott J, Himel VT. Torsional properties of nickel-titanium versus stainless steel endodontic files. J Endodon 1997;23:217-20.

PURPOSE: To investigate and compare maximum torque, torque at failure and angular deflection of stainless steel hand instruments and nickel-titanium rotary instruments.

M&M: Three files were tested: .02 taper K-type stainless steel (SS .02), .02 taper U-type NiTi files (Niti .02), and .04 taper U-type NiTi files (Niti .04). Sizes were 15, 25, and 35, with 20 files in each group.

RESULTS: All files met or exceeded ANSI/ADA specification #28. Niti .04 had significantly higher and Niti .02 had significantly lower values in all sizes. Max torque increased with file size in all groups. The difference between maximum torque and torque at failure was greater in the NiTi groups than in the SS group.

C&C: Nothing unexpected here: The less brittle instruments have a greater difference between max torque and torque at failure, and the SS has the least total angular deflection. However, the authors state that NiTi's oscillation of torque before failure was not shown here. This may reflect the instrument design of a U-shape.

April 1997 **Robin E. Hinrichs**

Lumley PJ. Cutting ability of Heliosonic, Rispisonic, and Shaper files. J Endodon 1997;23:221-4.

PURPOSE: To use a model system to assess how load, file type, file width, and air inlet ring opening affect the cutting ability of sonic files.

M&M: A model system was developed to evaluate sonic file cutting ability. The files were inserted into a MM 1500 (Micro Mega) sonic handpiece that was secured to a reciprocating arm. The arm was activated in a side-to-side manner using an eccentric cam attached to an electric motor operating at one cycle per second. Force was applied to specimens prepared from bone taken from a cow, cut to 1 mm thick sections. The specimens were instrumented using the middle part of the cutting portion of the files for 10 s. A new undamaged file was used for each cut. Variables evaluated were: i) file type, ii) width, iii) load, and iv) air inlet ring opening (power). Files evaluated were: Heliosonic, Rispisonic and Shaper types.

RESULTS: There was little difference between the Rispisonic and Shaper files or between 3/4 and full power setting. All the variables had a significant effect on the cutting ability of the files. The most significant variable was load, followed by file type, power, and width. The most significant interaction was power and load.

C&C: Heliosonic files have flutes, while Rispisonic and Shaper files are barbed.

April 1997 **Orest M. Harkacz, Sr.**

Torabinejad M, Pitt Ford TR, McKendry DJ, Abedi HR, Miller DA, Kariyawasam SP. Histologic assessment of mineral trioxide aggregate as a root-end filling in monkeys. J Endodon 1997;23:225-8.

PURPOSE: To investigate the response of periradicular tissues of monkeys to MTA and amalgam when used as root-end filling materials in teeth in which bacterial contamination of the root canals was avoided.

M&M: The 4 maxillary incisors of 3 monkeys were treated endodontically, with apical prep size of 40. GP and Roth sealer were used to obturate. After 1 w, periradicular surgery was carried out. The apical 3rd of the tooth was resected, prepped for 2 mm with a #6 round bur in a HS handpiece, and filled. Two teeth received MTA, and two received amalgam root end fillings in each monkey. The animals were sacrificed after 5 m.

RESULTS: The periradicular tissues around all amalgam fillings had moderate to severe inflammation. 5/6 of the MTA fillings showed no inflammation, while one showed severe inflammation. The other MTA fill in this animal showed no inflammation. Cementum was observed growing over all resected dentin surfaces, but was not seen over the amalgam fillings. It was observed completely covering 5/6 of the MTA fills. No bacteria were observed in any of the specimens. The cementum over the MTA had Sharpey's fibers inserted into it, but the incremental lines seemed to indicate that its source was the bone, not the adjacent periodontal ligament.

C&C: The difference in the direction of the incremental lines suggests to the authors that Craig and Harrison's suggested mode of healing - i.e. the source being the PDL is incorrect, and the source of the new attachment is the ingrowing CT from the bone.

April 1997 **Robin E. Hinrichs**

White RR, Hays GL, Janer LR. Residual antimicrobial activity after canal irrigation with chlorhexidine. J Endodon 1997;23:229-31.

PURPOSE: To determine if substantive antimicrobial activity could be induced with chlorhexidine irrigants in instrumented root canals in vitro.

M&M: Two chlorhexidine gluconate irrigants were tested: a 2.0% solution prepared from a stock supply and a 0.12% commercial oral rinse (Peridex). Negative control teeth were irrigated with sterile water. Single-rooted teeth were biomechanically instrumented, and with each change in file size the canal was irrigated with 1 ml of irrigant (either 2.0% or 0.12% chlorhexidine). After instrumentation, the canal was irrigated with 3 ml of sterile water to flush out the original irrigant. Samples of root canal fluid (sterile water placed in the chambers during the time interval) were absorbed with paper points at 6, 12, 24, 48, and 72 h after treatment. The paper points were assayed for antimicrobial activity by placing them on agar plate surfaces inoculated with *Streptococcus mutans* and measuring zones of inhibition.

RESULTS: Paper point specimens obtained from the teeth irrigated with sterile water did not produce zones of inhibition. Twenty-three teeth were treated with 2.0% chlorhexidine. Antimicrobial activity was detected in all specimens (6 through 72 hours). Twenty-one teeth were treated with 0.12% chlorhexidine. Antimicrobial activity was detected in the 6- and 12-h specimens of all teeth in this group, and in 15, 6, and 2 of the specimens collected at 24, 48, and 72 h, respectively. Comparing groups, the antimicrobial activity remaining in the 2.0% treated teeth was significantly greater than in the 0.12% treated teeth at all collection times.

C&C: These results indicate that chlorhexidine may instill substantive antimicrobial activity for up to 72 hours when used as an endodontic irrigant. The 2.0% formulation would appear to instill greater and longer lasting antimicrobial activity. However, chlorhexidine has no debriding capabilities. Therefore, antimicrobial activity may be enhanced, but canal cleanliness may be compromised if chlorhexidine were to be used as the sole irrigant during canal instrumentation.

April 1997 **Orest M. Harkacz, Sr.**

Coleman CL, Svec TA. Analysis of Ni-Ti versus stainless steel instrumentation in resin simulated canals. J Endodon 1997;23:232-5.

PURPOSE: To compare nickel-titanium (NT) and stainless steel (SS) instruments in curved resin simulated canals.

M&M: 20 pairs of resin blocks with 25^0 curvature were embedded in casting resin using Bramante's technique. Blocks were sectioned at ~2 mm from apical end, the middle of the curve, and a straight portion in the coronal part of the canal. 1 canal in each pair was prepared with SS, and 1 with NT instruments to a size 25, then flared to size 60. All files were precurved. Time of preparation was noted, starting after a #10 could be placed to length. Time, area, shape, and distance of transportation were analyzed using direct digital imaging. No irrigant was used.

RESULTS: There was no significant difference in area of the apical and coronal sections, only in the middle section. SS files removed more resin in the curve. Centering of the canal was not significantly different in the middle or coronal sections. The NT files transported less in the apical area. There was no difference in shape at any of the levels between groups. SS files prepared the canal significantly faster than the NT files.

C&C: The authors state that all files were precurved - how difficult is it to precurve the NT files accurately? The authors hoped to show that this resin block model could validate the use of resin models in canal instrumentation studies.

April 1997 **Robin E. Hinrichs**

Ibarrola JL, Knowles KI, Ludlow MO, McKinley IB. Factors affecting the negotiability of second mesiobuccal canals in maxillary molars. J Endodon 1997;23:236-8.

PURPOSE: To identify interferences that hinder the total or partial negotiation of MB2 canals in maxillary molars.

M&M: Eighty-seven extracted maxillary molars that had undergone endodontic treatment performed by sophomore dental students in an endodontic technique laboratory were sectioned and radiographed. The teeth were divided into 3 groups: Group 1 - consisted of roots in which two canals had been instrumented and obturated; Group 2 - consisted of roots that had two canals but only one had been instrumented and obturated; Group 3 - consisted of roots giving the radiographic impression of having only one canal. The coronal end of the roots in Groups 2 and 3 were ground to a smooth surface, and a #08 file was used in an attempt to negotiate a second mesiobuccal canal. If negotiated, the file was intentionally separated in the MB2 canals. The roots were decalcified, cleared and observed under stereomicroscope. After microscopic examination, the canal systems were grouped by canal configuration using Weine's classification.

RESULTS: Of the 87 samples examined, 67 (77%) showed evidence of a second canal in the mesiobuccal root. Eleven of these MB2 canals were identified and obturated. The attempt to negotiate the MB2 canals in the remaining teeth following root resection resulted in negotiating an additional 24 canals in their entirety and 17 canals partially. Fifteen MB2 canals could not be negotiated following root resection. Twenty MB roots had only one canal present (Type I). Twenty-eight MB roots had two canals with one common exit (Type II). Thirty-one MB roots had two canals with 2 separate foramina (Type III). Eight roots had a single canal that bifurcated into two separate foramina (Type IV). Factors affecting the ability to negotiate MB2 canals were identified as following:

Obstruction found in MB2 Canals

Non negotiable	Partially negotiable
Diffuse calcification and pulp stones (3)	Debris in type II canals (5)
Debris in type II canals (4)	Anatomical variations (4)
Type IV canals (8) (Retreatment not attempted)	Packing of dentinal mud (7)
	Separated instrument (1)

C&C: Worth noting is that seven of the canals that appeared calcified were actually blocked by the packing of dentinal mud with the pathfinding instrument. Several canals that gave the impression of being only partially negotiated were fully negotiated. MB2 canals were generally shorter than the principle canal. Excellent article!

April 1997 **Orest M. Harkacz, Sr.**

Yoshida T, Gomyo S, Itoh T, Shibata T, Sekine I. An experimental study of the removal of cemented dowel-related cast cores by ultrasonic vibration. J Endodon 1997;23:239-41.

PURPOSE: To examine the effect of enhancing the ultrasonic vibration by using two tips simultaneously and study the pathological effect of the vibrations on the periodontal tissue in dogs.

M&M: 40 incisors and 40 molars had cast post & cores cemented with zinc phosphate cement. After 24 h, an ENAC unit set on scale setting of 10 was applied either alternately at 2 different points, or at two opposite points at the same time. The angle of the tip was 90^0, and it was applied in 30 s increments. After each increment, an attempt to remove the post was made. In the dogs, 24 anterior and premolar teeth with healthy gingiva were subjected to the ENAC scale setting at 10 for 30 s at a time, with 2 tips at two points simultaneously. Total vibration times were 1, 3, 5, and 10 min. Animals were killed at 7 and 145 d and the tissue prepared and examined.

RESULTS: Removal of the posts was faster in single-rooted teeth than the multi-rooted teeth. Use of the two tip technique significantly decreased the time in both single- and multi-rooted teeth by more than 50%. Visual inspection of the dog gingiva immediately post sonication showed capillary hyperemia and vasodilation. At both 1 and 2 weeks post, the PDL appeared normal histologically in all time frames of vibration

C&C: The authors note that previous reports have shown that the cement on the opposite side from the tip is destroyed earlier, so the use of two tips placed on opposite sides is the next logical step. The histological results seem to show no lasting PDL damage. How did they visualize the capillary hyperemia and vasodilation in the gingival connective tissue under the junctional epithelium? No mention in the M&M was given.

April 1997 **Robin E. Hinrichs**

Steiner DR. Timing of extraction of ankylosed teeth to maximize ridge development. J Endodon 1997;23:242-5.

SUMMARY: Ankylosis as a result of replanting an avulsed tooth leads to arrested development of the associated alveolar ridge. If the ankylosed tooth is in infraocclusion, then it is a sign of arrested ridge development, which may lead to a defect in the alveolar process in that area. The severity of the defect will depend on the amount of facial growth that occurs after ankylosis. This correlates with the length of time an ankylosed tooth is retained during adolescent growth. A case is reported of arrested development of the alveolar ridge due to lack of treatment (extraction) at an appropriate time. An 8 year-old boy was treated for apexification of a tooth #9 (using calcium hydroxide) which had been avulsed two weeks previously. Six months later, ankylosis occurred. For 2 years, calcium hydroxide was replaced every 6 months. At age 10, the tooth was 1.5 mm in infraocclusion. The need for extraction was anticipated, but no action was taken by the parents for another 2 years. Calcium hydroxide continued to be replaced at 6 month intervals (no definitive obturation was performed in anticipation of tooth extraction). On eval at age 13½, the tooth was 5 mm in infraposition. Orthodontic treatment was started at age 16, at which time the tooth was 8 mm in infraocclusion. Clinical guidelines are presented to determine the optimal timing of extraction of ankylosed teeth to maximize alveolar ridge development.

April 1997 **Orest M. Harkacz, Sr.**

Alves LD, Donnelly JC, Lugo A, Carter DR. Reeruption and extrusion of a traumatically intruded immature permanent incisor: case report. J Endodon 1997;23:246-8.

PURPOSE: To report the treatment of an intruded maxillary incisor.

SUMMARY: A 7 yr. old presented with #9 having been completely intruded 6 months prior. Per x-rays showed no apparent apical pathosis or root resorption. A surgical exposure was accomplished to promote re-eruption. At 6 w, the tooth had erupted significantly, about 50%, showed no evidence of ankylosis, and responded to cold normally. At 3 months, the tooth showed no further eruption, so orthodontic extrusion was initiated. Forces were applied over a year. X-rays showed evidence of pulp canal obliteration, and the tooth remained responsive to cold and EPT.

C&C: The fact that this tooth retained it's vitality after a complete intrusion is remarkable, and can be attributed to the incomplete root development at the time of the trauma. No spontaneous re-eruption by this tooth was observed after intrusion, so the surgical exposure accomplished two things. It allowed for partial re-eruption, which allowed for access for the orthodontic brackets to be attached. A good case!

April 1997 **Robin E. Hinrichs**

MAY

Barbosa CAM, Goncalves RB, Siqueira Jr. JF, De Uzeda M. Evaluation of the antibacterial activities of calcium hydroxide, chlorhexidine, and camphorated paramonochlorophenol as intracanal medicament. A clinical and laboratory study. J Endodon 1997;23:297-300.

PURPOSE: To compare the antibacterial effects of calcium hydroxide, chlorhexidine gluconate, and CPMC clinically and in vitro.

M&M: *Clinical study*- 311 single-rooted teeth with necrotic pulps and radiographic evidence of periradicular lesions were cleaned, shaped, treated with citric acid followed by NaOCl (5.25%), and sealed with CPMC at the first appointment. At the second appointment, bacteriological testing was accomplished with paper points, and the teeth were then divided into three groups corresponding to intracanal medicaments tested: group 1 - CPMC on a cotton pellet; group 2 - calcium hydroxide paste; group 3 - 0.12% chlorhexidine. At the 3rd appointment, the medicaments were removed and bacteriological sampling was accomplished.
Laboratory study - The in vitro antibacterial activities of calcium hydroxide, CPMC, 0.12 and 0.2% chlorhexidine were evaluated against bacteria commonly found in endodontic infections. The agar diffusion test was the method used. The diameters of zones of inhibition around each medicament were recorded.

RESULTS: *Clinical study* - 27 out of 39 (69.2%) previously positive canals that received CPMC-dressings yielded negative cultures. 33 out of 45 (73.3%) calcium hydroxide cases were negative for bacterial growth. Negative cultures were obtained in 28 of 36 (77.8%) of the cases when chlorhexidine was used.
Laboratory studies - CPMC showed the largest zones of inhibition against all bacterial strains used in the study. The two chlorhexidine solutions were inhibitory against all bacteria tested, however, they were not more effective that CPMC. Calcium hydroxide/saline solution paste presented only inhibitory effects on 2 strains.

C&C: This study reveals that laboratory zones of inhibition do not necessarily correlate with clinical antibacterial effectiveness, as calcium hydroxide had the lowest zone of inhibition but one of the highest clinical antibacterial effects, while CPMC had the highest zone of inhibition, but the lowest clinical conversion to negative cultures.

May 1997 **Orest M. Harkacz, Sr.**

Hulsmann M, Rummelin C, Schafers F. Root canal cleanliness after preparation with different endodontic handpieces and hand instruments: A comparative SEM investigation. J Endodon 1997;23:301-6.

PURPOSE: To evaluate the cleanliness of root canal walls after preparation with 8 automated devices.

M&M: 150 mandibular incisors were accessed and divided into 10 groups. The Giromatic, Intra-Endo 3LDSY, Piezon Master 400 w/ 1% NaOCl, Piezon Master 400 w/ H_2O_2, Canal Leader 2000, Canal Finder System, Endoplaner, Excalibur, Endolift, and hand instrumentation made up the 10 groups. Separate evaluations of split root halves for debris and smear layer were accomplished.

RESULTS: No group had complete removal of debris. Ultrasonics with H_2O_2, Canal Leader 2000 and hand instrumentation showed the best results. Ultrasonics and hand instrumentation were the only ones to show uniform cleanliness in all parts of the root canal. Smear layer removal was best accomplished by ultrasonics and the Canal Leader 2000, with hand instrumentation, the Endoplaner, and the Giromatic close behind. Apical cleanliness was best with the ultrasonic system.

C&C: It seems that no matter which system you use for instrumentation, the use of ultrasonics enhances canal cleanliness as far as the removal of debris and the smear layer. The use of automated systems greatly speeds up the preparation, giving our irrigants less time to work which may actually be a detriment to our goal of complete canal debridement.

May 1997 **Robin E. Hinrichs**

Blum JY, Parahy E, Machtou P. Warm vertical compaction sequences in relation to gutta-percha temperature. J Endodon 1997;23:307-11.

PURPOSE: To evaluate the temperature range both in the gutta-percha mass and on the root surface, during warm vertical compaction performed by monomanual and bimanual techniques.

M&M: The root canal system was prepared in 24 maxillary incisors. For 12 teeth, channels were bored through the dentin from the external surface of the root to the internal pulpal wall, perpendicular to the tooth axis, at levels of 0, 2, 4, and 8 mm from the apex. Thermocouples were bonded in these orifices with autopolymerizing resin. For the other 12 teeth, thermocouples were fixed on the root surface using the same protocol. Each tooth was varnished to prevent leakage and fixed in an assembly which was immersed in a thermostable kettle at 37^0 C. Gutta-percha cones were then warm vertically condensed by either a monomanual method (standard method), with one hand alternately holding heater then plugger, and a bimanual method, with each hand holding an instrument (heater and plugger). Recording was started with the first impact of the insert and the thermocouples measured temperature as a function of time.

RESULTS: The maximal temperature at the extremity of the insert was 350 ± 20^0 C. For the thermocouples located at 8 mm and 4 mm in the canal, the temperature rise was significantly greater with the bimanual method. Maximal temperature was 118^0 C for the 8 mm level, 52^0 C for the 4 mm level, and 44^0 C for the 2 and 0 mm levels. At 0 mm, the temperature remained above 42.9^0 C for 10 ± 5 sec. The bimanual compactions (4.02 ± 0.3 min) were shorter than the monomanual ones (5.07 ± 0.2 min). The number of compactions for the bimanual

method (12 ± 2) was significantly different from that for the monomanual method (8 ± 1). During the monomanual method, the maximal temperatures stored by the surface at 8, 4, 2, and 0 mm were respectively 48^0 , 43^0, 40.9^0, and 40.2^0 C. For the bimanual method, maximal temperatures were respectively 49^0, 45.1^0, 40.6^0, and 40.2^0 C. There were no significant differences between the 2 methods. However, for each method the differences was significant at the 8 mm level compared to the other levels.

C&C: These results show the importance of heating down to a distance of 7 mm to ensure a significant increase in apical gutta-percha temperature for flow to occur. Also, the last compaction should last more than 15 s to avoid detrimental cooling and dimensional variations.

May 1997 **Orest M. Harkacz, Sr.**

Shakespeare RC, Donnelly JC. An in vitro comparison of apical microleakage after obturation with JS Quick-fill or lateral condensation. J Endodon 1997;23:312-4.

PURPOSE: To compare the mean apical leakage after root canal obturation with either JS Quick-Fill or lateral condensation.

M&M: 30 single-rooted teeth were prepared to a size 45 MAF with McXIMs. Canals were obturated using JS Quick-Fill, a thermocompaction technique with a carrier, or with lateral condensation. Teeth were suspended in India Ink for 7 days, then cleared.

RESULTS: Lateral condensation showed significantly less mean apical microleakage than JS Quick-Fill. Leakage was nearly 3x's as much with the Quick-Fill.

C&C: It would seem that the ability to condense the Quick-Fill in the apical portion after the withdrawal of the carrier is extremely limited.

May 1997 **Robin E. Hinrichs**

Pertot WJ, Stephan G, Tardieu C, Proust JP. Comparison of the intraosseous biocompatibility of Dyract and Super EBA. J Endodon 1997;23:315-9.

PURPOSE: To compare the biocompatibility of a new compomer (Dyract) to that of a reinforced zinc-oxide eugenol cement (Super EBA) by intraosseous implantation into the femur of rabbits.

M&M: Silicone carriers were loaded with Dyract or Super EBA and implanted through two holes drilled through the cortical plates of exposed femurs in 24 rabbits. One half of the rabbits were randomly killed 4 weeks after implantation and the other half 12 weeks after implantation. Sections were prepared and histologically evaluated. Tissue reactions were graded from none to severe.

RESULTS: At four weeks, both materials showed similar reactions, which varied from slight to moderate reactions characterized by the presence of fibrous tissue interposition and inflammatory cells. In all cases, the bone marrow was normal, the bone trabeculae showed living osteocytes and were bordered by active osteoblasts. Statistical analysis failed to show a significant difference between the two materials. At 12 weeks, both material showed slight reactions. Only one Super EBA specimen showed a moderate reaction. In the slight reaction cases, in some areas, new bone containing plump osteocytes and bordered by active osteoblasts was growing in direct contact with the materials. In other areas, thin fibrous tissue interposition was present between the new bone and the materials. Direct contact with bone was more frequently observed with Dyract, and the fibrous tissue layer was usually thicker with Super EBA. No statistical significant difference was found between the materials. Despite an apparent improvement in the tissue response, statistical analysis failed to show a significantly difference for each material between 4 and 12 weeks.

C&C: Dyract is a light cured compomer that is available in compules. This avoids the need for mixing, and the setting time is completely controlled by the operator. It is purported to bond to tooth structure without the use of undercuts, and its sealing ability was superior to Super EBA according to the citation noted by the author. It is not dual cured, so the inability to adequately illuminate the material with a curing light would be a contraindication to its use

May 1997 **Orest M. Harkacz, Sr.**

Mayer T, Eickholz P. Microleakage of temporary restorations after thermocycling and mechanical loading. J Endodon 1997;23:320-2.

PURPOSE: To evaluate the influence of thermocycling and mechanical load on different temporary materials for endodontic access.

M&M: 44 molars were accessed and had their pulps removed. The access cavities were filled with Cavit, a ZOE cement, IRM, or TERM. At least 3.5 mm was placed. Impressions of the occlusal surface was made after the material had set, after thermocycling and after occlusal loading. The margins of these replicas were evaluated with SEM. The teeth were immersed in dye for evaluation of microleakage.

RESULTS: Cavit had 70% "perfect" margins after the set. After thermocycling, 50% were still perfect, and no significant increase in dye leakage was observed. After loading, a significant increase of marginal gaps could be seen. Some collapse of the temporaries was noted after loading. IRM and the ZOE cement were inferior to Cavit with "perfect margins". Both materials showed the highest leakage of dye after thermocycling and mechanical loading. TERM had more marginal gaps than Cavit after the set. It held up to thermocycling well, but not to mechanical loading.

C&C: ZOE cements cannot seal, Cavit may collapse, and TERM has a high percentage of marginal gaps which increase after mechanical loading. The perfect temporary has yet to be found. It seems that Cavit, IRM and TERM are still the best choices. The addition of a glass ionomer to this study would have been very nice.

May 1997 **Robin E. Hinrichs**

Beling KL, Marshall JG, Morgan LA, Baumgartner JC. Evaluation for cracks associated with ultrasonic root-end preparation of gutta-percha filled canals. J Endodon 1997;23:323-6.

PURPOSE: To evaluate the use of ultrasonics for apical root-end preparation in gutta-percha filled roots versus uninstrumented canal systems and to examine the root-ends for cracks.

M&M: Forty bilaterally matched single-rooted human teeth with straight roots were divided into 2 groups. In group 1, the teeth were uninstrumented, and in group 2, standard access openings were made with crown-down, step-back instrumentation. The teeth in group 2 were obturated using lateral condensation with a D11T spreader. Condensation force was between 1.5 to 2.0 pounds of pressure. A 3-mm root-end resection was done on each tooth in both groups perpendicular to the long axis of the root. Methylene blue and transillumination were used to disclose and map any cracks. All teeth then received a root-end preparation using an EIE ultrasonic unit with ultrasonic retroprep tips at the lowest power setting. The CT-5 tip was used first to reach a depth of 3 mm, then followed by use of the CT-1 tip to complete the preparation in 17 pairs of teeth. The Slim-Jim tip was used to prepare 3 pairs of mandibular incisors. Teeth were kept moist the entire time to prevent desiccation and cracking of dentin. After at least 48 h in methylene blue, the root ends were again examined and cracks mapped.

RESULTS: There were no statistically significant differences when gutta-percha filled roots were compared to uninstrumented roots with regard to the number or type of cracks after root-end resection or root-end preparation. There were no significant differences in the number or type of cracks following root resection and ultrasonic root-end preparation when compared to teeth with root resection alone. There were no complete cracks seen in any of the specimens. The time for root-end preparation ranged from 3 to 5 min using the Slim Jim tips to 25 to 90 s when using the CT-5 and CT-1 tips. In general, it took less time to prepare gutta-percha filled canals than unfilled canals.

C&C: Variables to consider on creating root-end cracks not addressed in this study are: the effects of higher power settings, low amplitude vs. high amplitude vibrational forces, conventional vs. diamond coated tips, dry vs. wet cutting, and the shape and peripheral thickness of the root structure (do root concavities create areas of weakness prone to fracture).

May 1997 **Orest M. Harkacz, Sr.**

Guigand M, Vulcain JM, Dautel-Morazin A, Bonnaure-Mallet M. An ultrastructural study of root canal walls in contact with endodontic biomaterials. J Endodon 1997;23:327-30.

PURPOSE: To compare in vitro the structural and ultrastructural changes to the unmineralized extracellular matrix caused by various materials and to study the resulting endodontic/material interface.

M&M: 3 groups of 24 pig teeth were decoronated and depulped. No instrumentation was done. A control group, a calcium hydroxide (Spad)group and calcium oxide group each received their respective material inserted into the canal space with a root canal paste carrier under aseptic conditions. Samples were evaluated at 3, 8, 15 or 21 days.

RESULTS: The calcium oxide group - containing 66.7% heavy calcium oxide and 33.3% zinc oxide in 80% glycolated water showed a significant decrease in the volume of unmineralized extracellular matrix. All these samples showed intratubular penetration and material extending from the parietal zones by 3 - 150 microns. The predentine of teeth filled with Spad showed a lack of pulp residue, otherwise they were very similar to the control teeth.

C&C: The authors speculate that the calcium hydroxide material dissolves organic tissues, but does not effect the predentin. The calcium oxide material seemed to have an effect on both the organic and the predentin zones, eliminating the unmineralized extracellular matrix and producing as a result a tight, long-lasting seal. It was not clear in this study what was done with the control teeth.

May 1997 **Robin E. Hinrichs**

Wu MK, De Gee AJ, Wesselink PR. Leakage of AH26 and Ketac-Endo used with injected warm gutta-percha. J Endodon 1997;23:331-4.

PURPOSE: 1) To measure and compare the leakage through the root canals filled by injected warm gutta-percha with and without condensation using AH26 or Ketac-Endo as sealer; 2) to measure the distance between gutta-percha and root canal walls after condensing the warm gutta-percha during its cooling; and 3) to determine the film thicknesses of these two sealers.

M&M: 5 mm long root sections were made out of human canines with the removal of 4 mm of the root tip and the coronal part of the tooth. 104 root sections, of which the largest diameter of the apical canal opening was ≈0.5 mm and than of the coronal canal opening ≈ 1.5 mm were used. The canals were prepared and irrigated with 5.25% NaOCl and 17% EDTA for the AH26 groups and with 5.25% NaOCl and 40% citric acid for the Ketac-Endo group. Ten root canals (positive controls) were obturated with standard gutta-percha cylinders without sealer. Another 10 root canals (negative controls) were obturated with the same gutta-percha cylinders and AH26 sealer. 80 root sections were divided into 4 equal groups. 40 root canals were first coated with sealer, 20 canals for each sealer, and then filled with thermoplastic gutta-percha (Ultrafill) followed by vertical condensation with a force of 10 N. Another 40 root canals were obturated with the same material and by the same technique but without applying the vertical condensation procedure. The teeth were stored in 100% humidity for 1 week before leakage testing was accomplished using a fluid transport model. The remaining 4 root sections were obturated with vertical condensation as described above using colorless AH26. Three cross sections perpendicular to the axial direction were cut and elastomeric impressions were made of each cross section and cast in epoxy resin. Film thicknesses were measured as described by Ørstavik.

RESULTS: In the 10 negative controls, no fluid transport was recorded, whereas in the 10 positive controls the air bubble moved too fast to be measured. Without performing condensation the two sealers did not show significant difference in leakage. After condensation was applied, Ketac-Endo showed less leakage than AH26. The distance between gutta-percha and root canal walls at its broadest part in each cross section varied from 5 to 37 µm. In nine (82%) cross sections the distance was ≈ 25 µm. The film thickness was 39 ± 1 µm for AH26 and 22 ± 1 µm for Ketac-Endo.

C&C: AH26, with a film thickness of 39 µm, leaked more than Ketac-Endo with a film thickness of 22 µm after condensation. The authors stated that film thickness of sealer is an influencing factor on the sealing ability of a root canal filling when condensation of thermoplasticized gutta-percha is performed. From my interpretation, the gutta-percha is probably the weak link, since the negative controls were all filled with AH26 (containing a much greater thickness than the obturated canals) and had no leakage at all. Also, the differences in film thickness could be a function of condensation forces and root canal shape/anatomy in addition to the composition of sealer. They bring out an interesting point, stating that some sealers may not have adequate flow and film thickness to get into narrow spaces between gutta-percha, and that condensing gutta-percha too heavily may result in too narrow a space for the sealer to flow into. Therefore, it may be questionable whether a heavy condensation will, in all cases, result in an improved seal.

May 1997 **Orest M. Harkacz, Sr.**

Wayman BE, Patten JR, Hellstein J. Zebra XVI Part 1. J Endodon 1997;23:335-6.

SUMMARY: A long-awaited return of the Zebra hunt. A clinical case is presented, with the clinical and radiographic signs and symptoms. A differential diagnosis is suggested. Stay tuned to next month for further details, and to see if you correctly diagnosed it. My call is for a salivary gland tumor of some sort.

May 1997 **Robin E. Hinrichs**

Lilly JP, Law AS. Atypical odontalgia misdiagnosed as odontogenic pain: a case report and discussion of treatment. J Endodon 1997;23:337-9.

SUMMARY: Atypical odontalgia is characterized by prolonged periods of throbbing or burning pain in the teeth or alveolar process, which occurs in the absence of any identifiable odontogenic etiology. The pain may be bilateral and change location. Differentiation of this entity from pain of odontogenic origin is significant in order to prevent irreversible treatment procedures and to manage the condition correctly. Two cases are presented of atypical odontalgia that were initially misdiagnosed and treated as odontogenic pain. In case #1, root canal therapy was performed on teeth 8, 9, 13, and 14 with subsequent extraction of 8, 9 and 14 in an attempt to relieve the patient's discomfort. Her pain was in the maxillary and mandibular anterior and maxillary posterior quadrant. Atypical odontalgia was diagnosed and pharmacologic intervention with amitriptyline totally alleviated her discomfort. She has been free of pain for 1 year. In case #2, a 71 y.o. female presented with pain for about 1 year adjacent to tooth #4, which was subsequently extracted. This brought relief to 2 weeks, with the pain returning to the previous intensity but in the mandibular right area. Right local block anesthesia resulted in some, but not complete relief of pain. Trials of several medications did not alleviate her problems. Ultimately, alcohol injections were given in the area of the right mental nerve, followed by sectioning of the right inferior alveolar nerve. This did not relieve her pain. She is currently on nortriptyline, which has reduced, but not abated the pain.

C&C: If a patient presents with pain of non-odontogenic origin without a pathologic cause for the problem, it may be prudent to refer that person to a pain clinic.

May 1997 **Orest M. Harkacz, Sr.**

Blum JY, Esber S, Micallef JP. Analysis of forces developed during obturations. Comparison of three gutta-percha techniques. J Endodon 1997;23:340-5.

PURPOSE: To analyze warm vertical compaction (WVC), lateral condensation (LC), and thermomechanical compaction (TMC) in terms of the developed forces and the obturation duration.

M&M: 10 teeth were prepared and obturated with WVC. 18 teeth were prepared for obturation with lateral condensation. 10 used 2 spreader sizes for obturation, 8 used one spreader. In these eight, the GP was removed and they were reobturated with each of the remaining 3 different sized spreaders, one at a time after GP removal. 20 teeth were prepared for TMC. 10 were normally obturated, 5 obturated with a MacSpadden size that was too small, and 5 with the strongest compaction forces possible. Transducers attached to the roots measured and stored all force data for analysis.

RESULTS: The lateral forces of LC were significantly less than those of WVC or TMC. Vertical forces increased with the size of the spreader. The vertical forces of WVC were significantly higher than TMC or LC. The duration of obturation was least with TMC, and most with WVC. The results clearly indicate that gutta-percha deformation is due to spreader insertion, and not to the lateral exerted forces.

C&C: A nicely designed study. The discussion of the three phases of the MacSpadden Compactor technique is quite good. None of the forces generated seemed to be in the range previously shown to fracture roots.

May 1997 **Robin E. Hinrichs**

JUNE

Vajrabhaya L, Sithisarn P, Wilairat P, Leelaphiwat S. Comparison between Sulphorhodamine-B Dye Staining and 51Cr-Release Method in Cytotoxicity Assay of Endodontic Sealers. J Endodon 1997;23:355-7.

PURPOSE: To evaluate 51Cr-release against SRB dye staining method in cytotoxicity assays of six endodontic sealers.

M&M: Six different sealers (MU sealer, ROCANAL 2, ROCANAL 3, Apexit, Endomethasone, and AH-26) were freshly mixed and inserted into glass capillary tubes to a length of 5mm. This tube was used as a simulated canal. Each sealer containing tube was inserted through a plastic covering of a 96 well tissue culture plate so that the end containing the sealer was inserted below the surface of the mouse fibroblast culture medium to a depth of approximately 1mm. The specimens were incubated for 24h in the presence of the sealers. Cell viability was tested either by staining with sulphorhodamine-B dye using a spectophotometer or by measuring the amount of 51Cr in the supernatant of 51Cr-labeled cells.

RESULTS: Both techniques showed that Apexit was the least toxic sealer. The other 5 sealers were shown to be quite toxic using the SRB method. The 51Cr-release method showed all 6 sealers to be nontoxic.

C&C: The SRB technique has the advantages of ease in conducting the tests and of avoidance of handling radioactive compounds. The difference in results can be explained because in SRB dye binding assay, only cells that adhere to the surface of the tissue culture plate wells were stained, but in the 51Cr-release assay, radioactivity discharged into the medium by all the cells was measured. The sealers, with the exception of Apexit, caused the cells to become detached from the substratum, but the sealers themselves had little effect on the viability of the cells, both bound and detached.

June 1997 **Michael J. Mauger**

Kartal N, Cimilli HK. The degrees and configurations of mesial canal curvatures of mandibular first molars. J Endodon 1997;23:358-362.

PURPOSE: To further investigate the configurations and the degrees of root canal curvatures in clinical (CV) and proximal views (PV) of mesiobuccal and mesiolingual canals in the mesial root of mandibular first molars.

M&M: Six hundred and ninety-seven first molar teeth that had not received endodontic therapy were selected and their distal roots resected. Size 8 to 15 K-type reamers were placed into the MB and ML canals and radiographs of the CV and PV were obtained. The technique of Cunningham and Senia was used to detect primary and secondary root curvatures and Schneider's technique was used to detect the tertiary root canal curvatures.

RESULTS: Vertucci type II (two separate canals leave the pulp chamber and join short of the apex to form one canal and exiting at one apical foramen) was detected in 40.7% of canals. A subgroup was defined as Vertucci type IIa, in which two separate canals merge into one canal before reaching the apex. If two separate canals join within the apical foramen and then exit one apical foramen, they are called Vertucci type IIb.
Correlation analysis was used to determine if the degree of curvature of a canal seen in a CV correlated with its degree of curvature in a PV. A significant correlation was established between the primary curvature degree obtained in the CV of the MB canal and ML canals for all groups. No significant correlation was detected between primary curvature values obtained in the CV and PV of MB canals. A strong correlation was noted between secondary curvature in the CV of MB and ML canals only for Vertucci type II. A correlation was seen between the secondary curvature values obtained in CV and PV of ML canals for Vertucci type VI. A correlation was seen between the secondary curvature values obtained in the PV of the MB and ML canals for Vertucci type IV (Weine type III). A correlation between secondary and tertiary curvature values was noted in the CV of the ML canal for Vertucci type IV.

C&C: Vertucci type IV root canal configuration in mesial roots of mandibular first molars was detected at 53.7%. There is a direct relationship in degree of curvature between the MB and ML canals when viewed from a clinical radiograph. No correlation was found between CV and PV primary curvature values. More secondary curvatures could be seen in the PV than CV. All canal curvatures may not be seen in the clinical radiograph.

June 1997 **Rodney M. Waite**

Garcia AA, Narvarro LR, Castello VU, Laliga RM. Evaluation of a digital radiography to estimate working length. J Endodon 1997;23:363-5.

PURPOSE: To determine if there are differences between the results obtained using a digital radiological measurement system and the conventional method used for setting working length.

M&M: Four different methods for setting the working length were studied using 30 extracted single-rooted, straight incisors. Two of the methods used were direct: Method A measured using a file on an endodontic rule in mm and Method B using a file measured with calipers sensitive to one tenth of a millimeter. These methods were compared to two indirect methods: Method C made measurements with calipers on conventional radiographic film and Method D made measurements with a digital radiological system from a digital image. Radiographs were taken from three vertical angulations, 0, 15, and 30 degrees above the horizontal plane for both indirect techniques. Two operators used the four methods independently, to determine inter-operator variability.

RESULTS: There were no statistical differences between the direct and indirect methods.

C&C: Determining working length using digital radiography compares well with conventional methods.

June 1997 **Michael J. Mauger**

Rauschenberger CR, Bailey JC, Cootauco CJ. Detection of human IL-2 in normal and inflamed dental pulps. J Endodon 1997;23:366-70.

PURPOSE: To determine if IL-2 can be detected in normal and inflamed pulpal tissues classified by clinical symptoms and histological assessment.

M&M: IL-2 (interleukin-2) is secreted by helper T-cells and stimulates expansion of the helper T-cell population, activates other cytokines that orchestrate the cell mediated immune response, and may play a role in the pathogenesis or progression of pathologic inflammatory disease.
Twenty pulp samples were obtained from impacted third molar teeth (i.e. normal or healthy pulpal tissue) and twenty inflamed pulpal samples were collected from patients with carious molar teeth whose clinical symptoms were consistent with that of irreversible pulpitis. All experimental teeth were extracted routinely, fractured, and the pulpal tissue removed and sectioned longitudinally into equal halves. Half the tissue was placed in 4% paraformaldehyde, embedded, sectioned and stained with H & E. The remainder of the pulp was frozen at -70^{o}C until prepared for ELISA procedures. The amount of IL-2 was calculated by linear regression analysis for each pulpal tissue by using optical densities and dilution concentrations. A t-test and ANOVA were performed.

RESULTS: Eight samples for ELISA were lost and 4 samples were lost during histological preparation. There were significant differences between the IL-2 concentrations in the clinically normal and irreversibly inflamed pulpal tissues. Of the 20 clinically normal samples, 13 were normal tissues, 1 was necrotic, and 3 were mildly inflamed. Of the 20 inflamed samples, 11 were histologically inflamed, 1 was normal, 3 were too small for processing, and 5 were lost.

C&C: IL-2 was detected in all vital pulpal samples. The highest concentrations of IL-2 were detected in mildly inflamed pulps, followed by the moderate and severely inflamed tissues. IL-2 concentrations are significantly higher in irreversibly inflamed pulpal tissues as compared to asymptomatic normal samples. The study had problems with the small volumes of pulpal tissue and would benefit by having a larger sample size.

June 1997 **Rodney M. Waite**

Garces-Ortiz M, Ledesma-Montes C. Cytotoxicity of ketac silver cement. J Endodon 1997;23:371-3.

PURPOSE: To study the effect of a glass ionomer cement with silver particles (Ketac Silver) on pulp tissue.

M&M: Sixty healthy human premolars, scheduled for extraction for orthodontic reasons were divided into 2 groups of 30 teeth. All the groups were prepared with Class V cavity preparation using a high speed, water-cooled handpiece. The cavities were dried with sterile cotton pellets, and a base of Dycal was placed in each cavity. The experimental group was filled with Ketac Silver. The control group was filled with ZOE. These 2 groups were subdivided into 3 groups of 10 teeth each, which were extracted 15, 30, and 60 days later. Immediately after extraction the teeth were fixed, decalcified, embedded, sectioned and stained with H&E for histological evaluation of the pulp.

RESULTS: At 15 days, the pulps in the Ketac group showed vacuolization and disruption of the odontoblastic layer, edema, vasodilation, chronic inflammatory infiltrate, and necrosis. At 30 days, the Ketac group showed that the odontoblastic layer adjacent to the cavity preparation was necrotic or

lost. At 60 days, the coronal pulpal tissue was almost completely necrotic. The pulp tissue in the control teeth was without alteration. No patients were symptomatic from any groups during this study.

C&C: This study showed that Ketac Silver produced irreversible pulpal damage, even at 60 days. The use of a Dycal base does not prevent pulpal destruction under the experimental conditions. The authors cite other studies which show that glass ionomer cements are capable of inducing cell lysis and necrosis in the pulp.

June 1997 **Michael J. Mauger**

Ranly DM, Thomas HF, Jinkun C, MacDougall M. Osteocalcin expression in young and aged dental pulps as determined by RT-PCR. J Endodon 1997;23:374-7.

PURPOSE: To examine dental pulps of older and younger individuals for the expression of osteocalcin (OC) mRNA by RT-PCR (reverse transcription-polymerase chain reaction).

M&M: Dental pulps were obtained from third molars of young adults (17-25 y) or from molar teeth of individuals >50 y of age. The teeth were split and the pulps frozen with liquid nitrogen. Five teeth from each group had the RT-PCR analysis of both OC and GAPDH, a house-keeping gene used as an internal control, mRNA. To adjust for variable amounts of starting tissue, a ratio was established for each sample by dividing the value of OC by the value for GADPH.

RESULTS: OC was expressed by all the pulps evaluated. Evaluation by the t-test did not reveal the values for the ratios to be significantly different.

C&C: OC is a vitamin K-dependent bone and dentin protein which is synthesized by osteoblasts and odontoblasts. The expression of OC is invariably associated with the activity of these cells and makes a good marker to evaluate general pulpal aging. This study demonstrated that aging pulp retains cells capable of expressing OC mRNA.

June 1997 **Rodney M. Waite**

Jepsen S, Albers H, Fleiner B, Tucker M, Rueger D. Recombinant human osteogenic protein-1 induces dentin formation: An experimental study in miniature swine. J Endodon 1997;23:378-82.

PURPOSE: To evaluate the induction of new dentin formation in exposed dental pulps by recombinant human osteogenic protein-1.

M&M: Sixteen teeth from 4 miniature pigs were isolated with a rubber dam and pulp exposures 1 to 2 mm in diameter were created with sterile burs and high speed under water spray. Pulps were treated with either: 1) hOP-1/collagen moistened with saline at 3mg/tooth, 2) collagen moistened with saline at 3mg/tooth or 3) calcium hydroxide paste (Calxyl). The distribution of defects among animals was designed in such a way that in each animal one pair of contralateral teeth allowed for comparison of treatments 1 and 2 and another pair for comparison of treatments 1 and 3. The cavity was sealed with a thick mix of ZOE cement. The animals were sacrificed after 5 weeks at which time the teeth were prepared for histological examination and histomorphometric analysis using digitizing photomicrographs.

RESULTS: Extensive new formation of dentin leading to complete bridges over the defects was observed in all teeth with the hOP-1/collagen implant. Significantly more dentin formation was induced by the hOP-1/collagen than was induced by the calcium hydroxide. The thickness of the dentin bridges formed after calcium hydroxide treatment was always significantly less than of the ones induced b hOP-1/collagen. Dentin bridges in teeth treated with calcium hydroxide typically formed at the expense of the pulp chamber. The hOP-1/collagen is resorbed and replaced with a mineralizing tissue, whereas the calcium hydroxide remains in the defect superficial to the dentin bridge.

C&C: This recombinant human osteogenic protein-1 appears to be a promising pulp capping agent. It is bio-active, is completely resorbed and induces large amounts of dentin over exposed pulps without affecting their viability.

June 1997 **Michael J. Mauger**

Roig-Cayon M, Basilio-Monne J, Abos-Herrandiz R, Brau-Aguade E, Canalda-Sahli C. A comparison of molar root canal preparations using six instruments and instrumentation techniques. J Endodon 1997;23:383-6.

PURPOSE: To compare six different root canal instruments for the quality of canal preparation and the time needed for instrumentation.

M&M: One hundred-twenty mesial roots of mandibular molars had standard endodontic access made, then were divided into 6 groups. Group A (Flexofile, FF): A step-back technique with anticurvature filing was used. A size 2 and 3 GG were used in the coronal portion of the canal and instrumentation continued to a size 30 file at WL. The canals were step-back flared to a size 45. Group B (Canal Master U, CM): The middle and cervical thirds of the canal were instrumented 1 mm short of the beginning of the canal curve with the CM-U sizes 50 and 60 in a lowspeed hp, then stepping back in 1 mm increments with CM-U 70-100. CM hand instrument sizes 20-40 were then used to the WL, then step-back flared in 0.5 mm increments. Group C (Heliapical file, HA): Step-back technique with circumferential filing using the stainless steel Heliapical file similar to Group A.

Group D (Flexogate file, FG): Flexogate technique using stainless steel Flexogate files using anticurvature filing similar to Group A. Group E (Ultraflex NiTi, UF): Step-back technique with anticurvature filing using NiTi Ultraflex, similar to Group A but to a WL of size 40 and step-back to a size 55. Group F (Lightspeed, LS): Lightspeed technique using Lightspeed rotary instrument sizes 20-40 to the WL at 2000 rpm. Step-back was to a size 80 in 0.5 mm increments. All roots were cross-sectioned at 2, 5, and 9 mm from the apex and studied with a Wild Photomicroscope. The root canal shape and instrumentation times were evaluated.

RESULTS: At the 2 mm level, the CM and LS groups had significantly more round canals than the FF, UF, and HA groups. At the 5 mm level, the CM, FG, and LS groups had significantly more round canals than the FF, UF, and HA groups. The LS groups had significantly more round canals than the FG group. At the 9 mm level, the CM, FG, and LS groups had significantly more round canals than the FF, UF, and HA groups. Instrumentation time for the CM, and FG was significantly longer than the other four groups.

C&C: The FG and CM are similar files. The engine-driven files produced the roundest canals, but is round necessarily better?

June 1997 **Rodney M. Waite**

Guigand M, Vulcain J, Dautel-Morazin A, Bonnaure-Mallet M. In vitro study of intradentinal calcium diffusion induced by two endodontic biomaterials. J Endodon 1997;23:387-90.

PURPOSE: To compare calcium penetration into the dentin induced by calcium hydroxide and calcium oxide.

M&M: Single-rooted lower teeth from pigs were extracted, sectioned at the crown and the pulps removed. The teeth were divided into three groups of nine teeth: a control group (A), a calcium oxide group (B), and a calcium hydroxide group (C). Both ends of the teeth were sealed with zinc oxide/calcium sulphate cement without eugenol. The samples were incubated separately in a humidified container in an anaerobic chamber. Three teeth from each group were incubated for 8, 15, or 21 days. After incubation, the teeth were embedded in resin and polished to expose the root canal containing the material. The specimen were prepared for evaluation using a SEM equipped with a device which detects all elements with an atomic number superior or equal to 4. The concentration of Ca at different distances from the root canal was measured.

RESULTS: The specimens with calcium oxide showed a higher Ca/P ratio, than did the calcium hydroxide group and the distances over which the ratios increased were also greater than those of calcium hydoxide. This diffusion related into an alkaline pH in the root.

C&C: Calcium oxide seems to possess similar or superior properties to calcium hydroxide. It can enhance intratubular penetration of Ca ions, decrease the interface and promote the transfer of calcium from the filling material to the radicular dentin.

June 1997 **Michael J. Mauger**

Kobayashi C. Penetration of constricted canals with modified K files. J Endodon 1997;23:391-3.

PURPOSE: To describe a technique using K files with modified tips for the penetration of constricted canals.

M&M: One to 2 mm of the #10 21 mm K file tip was sliced diagonally with a diamond disc to reduce the diameter of the file tip. In some cases, 2 to 3 mm of the file tip was cut off and then sliced in the same way. In all discovered canals, attempts to penetrate to the apical foramen with ordinary #10 K files were made. When a file was blocked, the canal was designated as a penetration-difficult canal. Attempts to penetrate the apical foramen with modified K files with RC-prep were made. When no tug-back sensation was felt, the canal was designated as a nonpenetrable canal. Penetrations were confirmed with the electronic apex locator. A post-op radiograph was taken. A total of 263 canals of 1844 canals treated could not be penetrated with conventional #10 K files.

RESULTS: Penetration-difficult canals were 4.2% of the vital canals and 21.3% of the nonvital canals. Using modified K file, 74.9% of the penetration-difficult canals in non-vital teeth were penetrated. Penetration-difficult and nonpenetrable canals in vital teeth could not be penetrated 53.1% of the time. The frequency of the penetration-difficult canals was higher in mandibular canals than in maxillary ones. Accidental perforations were observed in 14 canals (0.8%) and breakage of the file in 7 canals (0.4%).

C&C: In penetration-difficult canals, the penetration of a non-vital canal was easier than that of a vital canal. His perforation and breakage percentages should be 5.3% and 2.7%, respectively, for the modified K file.

June 1997 **Rodney M. Waite**

Cailleteau JG, Mullaney TP. Prrevalence of teaching apical patency and various instrumentation and obturation techniques in United States dental schools. J Endodon 1997;23:394-6.

PURPOSE: To ascertain the frequency of teaching the patency concept and the type of instrumentation and obturation techniques taught in dental schools within the United States.

M&M: A patency survey was sent to the chair of Endodontics at 53 dental schools in the United States. The results of this survey are presented.

RESULTS: Forty-eight of the 53 surveys were returned completed. 50% of the schools teach the concept of apical patency to undergraduates and/or graduates. 83% teach a step-back instrumentation technique and 89.6% teach a lateral condensation technique for obturation.

C&C: The concept of patency has been advocated as a method that has the potential to decrease canal blockage, reduce ledging and possible perforation, and to improve access to the periapical tissues should the need for drainage arise.

June 1997 **Michael J. Mauger**

Svec TA, Powers JM, Ladd GD. Hardness and stress-corrosion of rubber dam clamps. J Endodon 1997;23:397-8.

PURPOSE: To evaluate the resistance of clamps from two manufacturers to conditions of stress-corrosion and to measure the hardness of the clamps.

M&M: Upper molar (UM), lower molar (LM), and premolar (PM) clamps were obtained from two manufacturers (A - Hu-Friedy and B - Heraeus Kulzer). Rockwell C hardness was measured for four clamps of each type at four sites on the bow of each clamp. The same number of fresh clamps of each type and manufacturer were subjected to a stress-corrosion test. The clamps were placed on blocks that corresponded to the average buccal-lingual dimension of the tooth on which they are usually placed. The clamps were then submerged in 5.25% sodium hypochlorite for 20 min at room temperature. This cycle was repeated 10 times, then the clamps were examined for evidence of fracture or corrosion.

RESULTS: UM and LM clamps from manufacturer B were harder than those from manufacturer A, whereas PM clamps form manufacturer A were harder than those from manufacturer B. The stress-corrosion test resulted in no broken or corroded clamps from manufacturer B, whereas all of the initial group clamps from manufacturer A fractured and corroded. Subsequently, an additional group of clamps from manufacturer A with modified heat treatment had no fractures, but exhibited some corrosion. A second additional group did not fracture or corrode.

C&C: I think it would have been more clinically relevant if they would have subjected the clamps to repeated sterilization procedures, along with the hardness tests. It kind of makes you want to check any clamps made by Hu-Friedy.

June 1997 **Rodney M. Waite**

Beltes P. Endodontic treatment in three cases of dens invaginatus. J. Endodon 1997;23:399-402.

PURPOSE: To present three case studies of dens invaginated teeth with periapical lesions.

SUMMARY: Three case studies of successfully treated dens invaginatus are presented. The first case is a maxillary canine with an Oehlers type 2 dens invaginatus which is treated with NSRCT with radiographic healing at 6 months. The second and third cases are Oehlers type 3 which are both treated surgically after the obturation. These two cases also showed evidence of radiographic resolution at 6 months.

June 1997 **Michael J. Mauger**

Wayman BE, Patten JR, Hellstein J. Zebra XVI Part 2. J Endodon 1997;23:403-4.

SUMMARY: A 3 X 4 cm swelling of the left side of the palate, with no associated PA radiolucencies and present for months was described. All of the teeth in the quadrant were vital to cold and normal to percussion and palpation. The differential diagnosis included:
Odontogenic lesions

- calcifying epithelial odontogenic tumor
- calcifying odontogenic cyst
- periapical ameloblastoma
- odontogenic myxoma
- pleomorphic adenoma
- mucoepidermoid carcinoma
- adenoid cystic adenocarcinoma

Neurofibroma - neurofibromatatosis is autosomal dominant, may occur at any age, and is related to an abnormality of chromosome 17. Café au lait spots are generally the first feature to appear. Intraoral neurofibromas have been reported in from 7% to 20% of cases in von Recklinghausen's disease. The final diagnosis was reached based on additional clinical findings and histological examination.

June 1997 **Rodney M. Waite**

JULY

Beltes PG, Pissiotis E, Koulaouzidou E, Kortsaris AH. In vitro release of hydroxyl ions form six types of calcium hydroxide nonsetting pastes. J Endodon 1997;23:413-5.

PURPOSE: To compare the pH values of various calcium hydroxide-based pastes used as intracanal medicaments over a period of 5 days.

M&M: Calasept, Calcicur, Calxyl red, Calxyl blue, Reogan rapid, and Tempcanal samples were placed into dialysis tubing. The release of OH^- was done by measuring the change in pH values using a pH meter. Measurements were carried out after ½, 1, 1 ½, 1 ¾, 2, and 8 h during the first day and then once a day for 4 more days.

RESULTS: The pH values measured from the samples were all alkaline. After a fast rate of OH- release during the first 2 h by all compounds, the OH- release rate slowed down reaching a steady state.

C&C: This was a new technique for measuring pH of Ca(OH)2 containing intracanal dressings.

July 1997 **Rodney M. Waite**

Pertl C, Amann R, Odell E, Robinson PD, Kim S. Effects of local anesthesia on Substance P and CGRP content of the human dental pulp. J Endodon 1997;23:416-8.

PURPOSE: To determine SP and CGRP content in the human pulp after extraction under general anesthesia and to determine whether additional local anesthesia has an effect on their neuropeptide content.

M&M: Dental pulps were obtained from patients who had their third molars removed under general anesthesia. On one side the maxillary and mandibular third molars were removed without anesthesia. The other side third molars were removed after buccal and lingual infiltration of 4% prilocaine without vasoconstrictor. The pulps were immediately frozen and removed from the teeth. The amount of immunoreactive Substance P and immunoreactive calcitonin gene-related Peptide (iCGRP) was determined.

RESULTS: Pulps obtained from lower teeth without local anesthesia contained an average of 131 $\pm$ 62 fmol/mg protein of iCGRP and 15 $\pm$ 9 fmol/mg iSP. With additional mandibular block anesthesia the values were 194 $\pm$ 71 fmol/mg iCGRP and 12 $\pm$ 3.6 fmol/mg iSP.

C&C: This study shows that local anesthesia causes and increase in pulpal neuropeptides during surgical extraction.

July 1997 **Michael J. Mauger**

Gilles JA, Carnes DL, Dallas MR, Holt SC, Bonewald LF. Oral bone loss is increased in ovariectomized rats. J Endodon 1997;23:419-22.

PURPOSE: To demonstrate the effect of bone resorbing factors on oral bone and determine whether bone loss is increased in OVX (ovariectomized) rats.

M&M: Ninety day old normal and ovariectomized rats were used 3 w after surgery to allow estrogen depletion simulating postmenopausal bone loss. Endodontic access openings were made through the crowns into the pulp chambers of mandibular first molars of OVX and normal rats. The distal root canals were instrumented with K-type files to size 20. Bone resorbing factors, either IL-1 or (C rectus) CR314 LPS were deposited into the distal root canal of the left mandibular molar. The canals were sealed with Cavit. This procedure was repeated for 3 d creating PA areas of bone resorption. The mandibles were dissected free and radiographed. Bone resorption was evaluated by automated image analysis of radiographs. The left first molar was the test specimen and the contralateral tooth served as the control.

RESULTS: Both OVX and non-OVX rats showed a significant increase in resorption with IL-1. There was a significant increase in resorption seen in OVX controls when compared with the non-OVX controls. The addition of CR314 LPS produced significant increases in resorption compared to controls in both the OVX and non-OVX rats similar to the effects seen with IL-1.

C&C: Estrogen deficiency results in increased oral bone loss in rats.

July 1997 **Rodney M. Waite**

Fitzpatrick EL, Steiman HR. Scanning electron microscopic evaluation of finishing techniques on IRM and EBA retrofillings. J Endodon 1997;23:423-7.

PURPOSE: To evaluate, with SEM, the dentin/retrofilling interface when using IRM and SuperEBA that use three different finishing techniques.

M&M: 31 teeth were divided into six groups of five teeth and one control group. The teeth were instrumented to a minimum of a 35 K-file, obturated with GP and resected perpendicular to the long axis of the tooth. The root-ends were ultrasonically prepared and filled with either IRM or SuperEBA and finished by ball-burnishing, burnishing with a moistened cotton pellet, or with a carbide finishing bur in a highspeed handpiece. The retrofillings were then examined using an SEM.

RESULTS: Retrofillings finished with a finishing bur displayed significantly better marginal adaptation and little evidence of flash when compared to the other techniques.

C&C: The appearance of the tooth/root-end filling interface was only examined in this study. The effect of the finishing bur on the apical seal of the restoration was not determined.

July 1997 **Michael J. Mauger**

Leonardo MR, Silva LAB, Utrilla LS, Assed S, Ether SS. Calcium hydroxide root canal sealers - histopathologic evaluation of apical and periapical repair after endodontic treatment. J Endodon 1997;23:428-32.

PURPOSE: To evaluate histologically the apical and periapical repair of dogs' teeth after biopulpectomy and root canal filling with different sealers containing calcium hydroxide.

M&M: The 2nd, 3rd, and 4th lower premolars and the 2nd and 3rd upper premolars of 4 adult dogs were selected for treatment. The teeth were isolated with a RD, and instrumented to 2 mm below the radiographic apex. EDTA was applied for 3 min, then the canals obturated with lateral condensation of gutta-percha. All four of the calcium hydroxide materials were tested in the same animals: Sealapex, CRCS, Apexit, and Sealer 26. The teeth were restored with amalgam over a ZnPhos base. The animals were sacrificed 180 d later, the roots were cut into serial sections, stained, and examined.

RESULTS: Of the 16 roots sealed with Sealapex, when filling was localized below the apical foramen, full sealing of the root apex occurred in 6 roots (37.5%) consisting of a mineralized tissue. Inflammatory cells were absent in 14 cases, except macrophages containing filling material. If sealing material was localized below the apex there were no areas of mineralized tissue reabsorption. In the 17 roots sealed with CRCS, full root apex sealing with mineralized tissue was not observed; partial sealing was noted in 11 roots (64.7%). The periapical region presented an inflammatory response of variable intensity. Reabsorption areas of the root cementum were noted in 7 roots. Of the 18 roots sealed with Apexit, 13 didn't have material extravasate. Of those, 69.2% showed absence of sealing. The periapical region presented with an inflammatory cell infiltrate of a moderate/severe type. Biological sealing with mineralized tissue of the root apex was absent in 14 of the 17 roots studied (82.4%) in the Sealer 26 group. This group had an absence or mild inflammatory infiltrate in all 17 roots. There were areas of active cementum reabsorption in 15 roots.

C&C: Sealapex best permitted the deposition of mineralized tissue at the apical level and was the only sealer that presented full sealing of the root apex. Overfilling, regardless of the sealing material used, hampered the expected biological sealing.

July 1997 **Rodney M. Waite**

Conrads G, Gharbia SE, Gulabivala K, Lampert F, Shah HN. The use of a 16S rDNA directed PCR for the detection of endodontopathogenic bacteria. J Endodon 1997;23:433-8.

PURPOSE: To evaluate the procedure for the detection and differentiation of the representative oral bacteria *Actinomycetales* ssp., *Bacteroides frosythus, Fusobacterium nucleatum, and* streptococci of the "S. *milleri*-group.

M&M: A total of 17 samples were collected from 16 patients to evaluate the 16S rDNA directed polymerase chain reaction (PCR) in this study. The 16S rDNA directed forward primer in combination with a highly specific reversed one was used to amplify taxon specific gene fragments of 230 to 950 bp length. A similar PCR reaction using a universal 16S rDNA reversed primer was also established to demonstrate bacteria in root canal specimens in general.

RESULTS: The presence of *Actinomycetales*-species, *Fusobacterium nucleatum, Streptococcus milleri,* and *Bacteroides forsythus* were identified in the canal.

C&C: This method is an alternative to culturing in identifying bacteria. This newer method is more sensitive.

July 1997 **Michael J. Mauger**

Kaplan AE, Goldberg F, Artaza LP, De Silvio A, Macchi RL. Disintegration of endodontic cements in water. J Endodon 1997;23:439-41.

PURPOSE: To evaluate the qualitative and quantitative disintegration in water of three endodontic cements.

M&M: Ketac Endo, Tubli Seal, and AH26 samples were placed between two celluloid sheets and pressed using glass plates. They were stored at 37^0C and $\geq$ 95% humidity for 24 h, then weighed and immersed in distilled water. Specimens were divided into 3 groups: 48 h, 7 d, and 45 d. The difference between the original mass of the flask and final mass was calculated. The chemical stability was studied using polyethylene tubes immersed in distilled water. Samples were divided into groups as before and the open end of the tubes photographed before and after the time periods. Photographs were ranked on the degree of disintegration of the exposed surface.

RESULTS: There was no statistical difference among the materials in mass loss. A significant influence of time and its interaction with the materials was found. Tubli Seal and AH26 disintegration was not so evident; Ketac Endo the alteration was more evident.

C&C: No difference was found in the quantitative analysis of the materials. Ketac Endo suffered the highest disintegration.

July 1997 **Rodney M. Waite**

Dagher FB, Yared GM, Machtou P. Microleakage of a new and an old Kerr root canal sealers. J Endodon 1997;23:442-3.

PURPOSE: To compare, over an extended period of time, the sealing ability of the old and the new Kerr's Pulp Canal Sealer in vertical condensation where the use of a sealer with an extended working time might be desirable and high heat conditions are present.

M&M: 60 straight anterior teeth were instrumented to a size 30 file at the apex. The teeth were divided equally into two groups. One group was obturated with GP and Pulp Canal Sealer using vertical condensation. The other group was also obturated with GP using vertical condensation, but with Pulp Canal Sealer EWT. The leakage of the two groups was examined using a fluid filtration device at 90 min, 1 day, and 1, 4, 12, 18, and 24 wk after obturation.

RESULTS: There was no difference in leakage between the two groups. Leakage tended to increase over time for the two groups.

C&C: The new formula (extended working time) did not affect microleakage results.

July 1997 **Michael J. Mauger**

Segura JJ, Llamas R, Rubio-Manzanares AJ, Jimenez-Planas A, Guerrero JM, Calvo JR. Calcium hydroxide inhibits substrate adherence capacity of macrophages. J Endodon 1997;23:444-7.

PURPOSE: The effect of calcium hydroxide on substrate adherence capacity of inflammatory macrophages was investigated to determine if calcium hydroxide could produce some of its effects acting directly on inflammatory cells, such as macrophages.

M&M: Macrophages were studied because they are implicated in bone resorption and play an essential role in the pathogenesis of human periapical pathosis. Peritoneal macrophages were elicited from 6 to 12 w old Wistar rats. Calcium hydroxide was added to aliquots of cell suspension and adherence assays were performed at 5, 15, or 30 min incubation periods.

RESULTS: Calcium hydroxide decreased substrate adherence capacity of inflammatory macrophages in a time- and dose- dependent manner.

C&C: Calcium hydroxide could inhibit the phagocytosis in macrophages and reduce the inflammatory reaction in periapical tissues and pulp when used. This effect could explain the mineralized tissue-inducing property of calcium hydroxide: osteoclasts and dentinoclasts, macrophage-derived cells, could decrease their functions by action of calcium hydroxide and then, osteogenic mechanisms would predominate.

July 1997 **Rodney M. Waite**

Mehlhaff DS, Marshall JG, Baumgartner JC. Comparison of Ultrasonic and high-speed-bur root-end preparations using bilaterally matched teeth. J Endodon 1997;23:448-52.

PURPOSE: To compare ultrasonic and high-speed bur root-end preparations.

M&M: 76 roots from 29 bilaterally matched pair in human cadavers were used to compare the size of bony crypt, the minimum depth of root-end filling in a mesial-distal and buccal-lingual direction, the length of the root-end filling along the resected root surface, and the root-end resection bevel angle. Half of the teeth were prepared with high speed bur and filled with amalgam. The other half of the matched pair teeth was prepared with ultrasonics and also filled with amalgam.

RESULTS: The mean mesial-distal minimum depths of ultrasonic and high-speed bur preparations were 2.11 mm and 1.39 mm, respectively. The mean buccal-lingual minimum depth of preparation was 2.51 mm for the ultrasonic and 2.05 mm for the high-speed bur preparations. The depth of the ultrasonic preparations was significantly greater for both measurements. A significantly greater bevel angle was associated with the bur preparations, 35.1 versus 16 degrees for the ultrasonic preparations. All the bur preparations deviated from the long axis of the canal. Only 2.6% of the ultrasonically prepared roots deviated from the long axis. The bony crypts for the bur preparations were significantly greater than for the ultrasonic preparations.

C&C: The ultrasonic tip produces a deeper root-end preparation and less of the root-end is beveled to facilitate preparation and root-end filling placement.

July 1997 **Michael J. Mauger**

Zaatar EI, Al-Kandari AM, Alhomaidah S, Yasin MA. Frequency of endodontic treatment in Kuwait: radiographic evaluation of 846 endodontically treated teeth. J Endodon 1997;23:453-6.

PURPOSE: To determine the frequency of endodontic treatment delivered by two endodontists in a 2 years' time in Kuwait, and the type, distribution and apical exits of the teeth.

M&M: Endodontic files of 741 patients were obtained and the radiographs evaluated by two endodontists.

RESULTS: The tooth most frequently treated was the mandibular first molar (17.4%), then the maxillary first molar (15.7%), then the maxillary second premolar, then maxillary central incisor. All maxillary and mandibular anterior teeth exhibited a single root with one root canal and one apical foramen. Of the maxillary first premolars, 43% had one root and 53.2% h ad two roots with two canals. Maxillary second premolars had one root 78.6% and two roots with two canals 20.4% of the time. Mandibular first premolars had one root 85% in which 60% had one canal with one apical foramen and 25% had two canals with two separate apical foramina. Mandibular second premolars had one root with one foramen 95.3% of the time. Maxillary first molars had three canals in 59.4% and four canals in 40.6% of the teeth. Two foramina were present in the MB root in 15% of the teeth. The maxillary second molars showed three canals 76.1% of the time. Of the mandibular first molars studied, 97.3% had two roots, 69.2% (typo in article) had three canals, and 30.1% had four canals. T he mesial root had two canals with one apical foramen 42% and two separate apical foramina 27.2% of the time. In the mandibular second molars, the mesial root had two canals with one apical foramen in 60% of the teeth.

C&C: Their results were similar to most other tooth anatomy studies, except for the mandibular first premolar, which were higher, and the MB root of maxillary first molars having a fourth canal, which were lower than most other studies.

July 1997 **Rodney M. Waite**

Morse DR. Infection-related mental and inferior alveolar nerve paresthesia: Literature review and presentation of two cases. J Endodon 1997;23:457-60.

SUMMARY: This article presents two cases in which infection in the mental and inferior alveolar nerve resulted in paresthesia. The first case is of tooth #18 in which a chloropercha overfill occurred near the inferior alveolar canal. The tooth was asymptomatic for 2.5 years, then the periapical lesion enlarged and swelling, pain, and paresthesia developed. The paresthesia was resolved after periapical surgery. The second case is of tooth #28 in which paresthesia resulted 1 day after treatment with a squeezed dry formocresol cotton pellet. The paresthesia seemed to be infection related and was treated with irrigation, antibiotics, and steroids. The paresthesia resolved in 7 weeks. The paresthesia in these cases can be caused by several factors. One is mechanical pressure due to the expanding infectious process and the associated edema placing pressure on the nerve fibers. The second factor is related to microbial products which can result in deterioration of the nerve bundle or which can affect tissue metabolism in the region of the infection and could impair neural conduction.

July 1997 **Michael J. Mauger**

AUGUST

Miyashita M, Kasahara E, Yasuda E, Yamamoto A, Sekizawa T. Root canal system of the mandibular incisor. J Endodon 1997;23:479-84.

PURPOSE: To provide clinical data on canal configuration in an attempt to more accurately assess the efficiency of mechanical instrumentation, thus providing better guidelines for the preparation of root canals in endodontic therapy.

M&M: 1085 mandibular incisors were vacuum injected with India ink, decalcified, and cleared. The teeth were examined for canal configuration, thickness and curvature of the root canals, condition of any accessory canals and location of the apical foramen.

RESULTS: Only 12.4% of the teeth had two canals and only 3.1% had two foramina. The apical foramen was located in the center of the apex in half of the specimens. A #40 reamer will clean 70% of the roots at the 0.5mm from the apex level and 60% of the root canals at the 1mm level.

C&C: A lower number of double canals as compared with other studies; however this study had more number of mandibular incisors than the other cited studies such as Benjamin and Dowson.

August 1997 **Michael J. Mauger**

Calland JW, Harris SE, Carnes DL. Human pulp cells respond to calcitonin gene-related peptide in vitro. J Endodon 1997;23:485-9.

PURPOSE: To report the effects of CGRP on human pulp cells in culture, demonstrating that neuronally derived CGRP can stimulate increased BMP-2 (bone morphogenic protein-2) production in these cells.

M&M: Pulp tissue was obtained from human third molars . Cell monolayers were replated for characterization and binding studies or for mRNA isolation. CGRP binding studies were carried out. Cells were plated and human PTH, calcitonin, and CGRP were added, then the intracellular cAMP quantitated. Alkaline phosphatase levels were determined by addition of human PTH and 1,25 $(OH)_2D_3$. Osteocalcin was assayed after addition of 1,25 $(OH)_2D_3$.

RESULTS: Analysis of mRNA revealed BMP-2 in cells explanted from human pulp tissue. Stimulation with CGRP resulted in a 1.8 fold increase in the amount of mRNA for BMP-2. Stimulation of cells with TGF-B1 resulted in a similar increase in BMP-2 mRNA expression. Cyclic AMP production was stimulated by CGRP (2.8X), PTH (2.6X) and calcitonin (1.9X). Alkaline phosphatase enzyme activity was not altered when the cells were treated with CGRP or PTH or 1,25 $(OH)_2D_3$. Increased osteocalcin production in response to 1,25 $(OH)_2D_3$ stimulation occurred.

C&C: Sensory fibers containing CGRP are a major component of dental innervation. The terminal branches of these fibers sprout after injury, and there is an association between sprouting and sites of tertiary dentin formation. BMPs are involved in tertiary dentin formation by odontoblasts. CGRP stimulation of BMP-2 expression in injured pulp tissue is an important step in pulpal repair and defense, leading to tertiary dentin formation. CGRP is capable of specific binding to intact pulp cells and can stimulate the production of cAMP, which is associated with signal transduction of peptide hormones.

August 1997 **Rodney M. Waite**

Liu C, Wang W, Shen W, Chen T, Hu L, Chen Z. Evaluation of the biocompatibility of a nonceramic hydroxyapatite. J Endodon 1997;23:485-9.

PURPOSE: To determine whether or not calcium phosphate cement (CPC) has adverse effects on humans.

M&M: CPC was tested in a variety of different assays to determine biocompatibility. The tests include: systemic injection acute toxicity assay (using mice), cell culture cytotoxicity assay (Chinese hamster ovary cells), Ames test , micronucleus assay (mice), unscheduled DNA synthesis test (rats), and implantation into rabbit bone and muscle.

RESULTS: Calcium phosphate cement had no toxicity, mutagenicity, or carcinogenicity in any of the tests. The implantation test showed that a thin fibrous connective tissue covered the implant with a small number of inflammatory cells present.

C&C: CPC appears to be biocompatible and a possible material for endodontic use.

August 1997 **Michael J. Mauger**

Craig RG, Zuroff M, Rosenberg PA. The effect of endodontic materials on periodontal ligament cell proliferation, alkaline phospatase activity, and extracellular matrix protein synthesis. J Endodon 1997;23:494-8.

PURPOSE: To report on the effect of four commonly used endodontic materials on periodontal cell proliferation, alkaline phosphatase activity, collagen, and non-collagen synthesis.

M&M: Periodontal ligament (PDL) and gingival connective tissue (GCT) cells were removed from rat pups. Cells were cultured in plates coated with amalgam, calcium hydroxide, gutta-percha, a titanium reinforced composite, or untreated tissue culture plastic. Levels of collagen (CDP) and noncollagen (NCP) protein synthesis were measured by the incorporation of ^{3}H-proline into collagenase digestible and nondigestible protein. Alkaline phospatase was measured using a commercially available kit. The expression of cementum-associated extracellular matrix protein (CP_{42}) in culture was determined by immune dot blot using a monoclonal antibody.

RESULTS: There were no significant differences in DNA content between the five groups tested. Levels of CDP, NCP, and percent collagen synthesis were greater for PDL cells cultured on tissue culture plastic. No significant difference was noted between levels of CDP or NCP for PDL cells grown on gutta-percha, calcium hydroxide, amalgam, or titanium-reinforced composite. If the protein synthesis data were expressed as PCS, which does not incorporate DNA values into its calculation, no significant difference between PDL cells grown on plastic vs calcium hydroxide was found. The highest levels of alkaline phosphatase were found from cells cultured on tissue culture plastic. The lowest on gutta-percha.

C&C: Regeneration of PA tissues and the periodontal connective tissue attachment is a primary objective of endodontic therapy. Calcium hydroxide looks like the winner. This model may be of value in the development and study of the biologic response to biomaterials that support periodontal regeneration.

August 1997 **Rodney M. Waite**

Siqueira J, Araujo M, Garcia P, Fraga R, Dantas C. Histological evaluation of the effectiveness of five instrumentation techniques for cleaning the apical third of root canals. J Endodon 1997;23:499-502.

PURPOSE: To compare the cleaning of the apical third of the root canal by five instrumentation techniques, through histologic evaluation.

M&M: 53 mesial canals of mandibular molars with curvatures of between 25 and 40 degrees were instrumented with either a step-back technique using stainless steel files, step-back using NiTi files, ultrasonic preparation, balanced forces technique, or Canal Master U technique and instruments. In all techniques, 5% NaOCl was used between each file size. The teeth were then decalcified, stained and sectioned for evaluation of canal cleanliness using a light microscope.

RESULTS: There was no statistical difference between any of the techniques studied. All techniques cleaned the main canals but none was able to totally clean fins or isthmuses.

C&C: I was surprised that the ultrasonic group with sodium hypochlorite irrigation was unable to clean the isthmuses.

August 1997 **Michael J. Mauger**

Short JA, Morgan LA, Baumgartner JC. A comparison of canal centering ability of four instrumentation techniques. J Endodon 1997;23:503-7.

PURPOSE: To compare three NiTi rotary systems with step-back hand filing using ss K-type files for their ability to remain centered in the apical, middle, and coronal portions of the canal. The time of preparation for each technique was also compared.

M&M: Fifteen pairs of mandibular molars were used. Each pair had one of four M canals instrumented with: step-back technique using Flex-R hand files, McXIM files, Lightspeed files, and ProFile 0.04 taper files. Specimens were processed using a modified Bramante technique. Images were captured with a video camera, instrumented to a size #30, disassembled and imaged, reassembled, instrumented to a final MAF size #40, and imaged. The final images were superimposed over the preoperative images and the amount and direction of canal transportation was measured.

RESULTS: The NiTi systems remained better centered in the canal than the ss hand files. There were no significant differences among the NiTi systems at any level. The difference between hand filing and the NiTi techniques was more pronounced at size #40 than at size #30. The NiTi instrument systems were faster than hand filing.

C&C: The systems all took the same amount of time to instrument the canals, despite some systems having more instruments than others. The use of ProFiles resulted in greater canal area at the middle and coronal levels at the size #30 due to their 0.04 taper design. Preparation time might be decreased by using a combined technique of NiTi systems.

August 1997 **Rodney M. Waite**

Taylor J, Jeansonne B, Lemon R. Coronal leakage: Effect of smear layer, obturation technique, and sealer. J Endodon 1997;23:508-12.

PURPOSE: To examine the effect of smear layer removal in relation to the ability of various types of filling materials and techniques to limit coronal leakage.

M&M: 210 single rooted teeth with the crowns removed were divided into 20 different groups. The groups had either smear layer present or removed. The sealer used was either AH-26 or Roth's 811. The techniques of obturation were lateral condensation with or without vertical compaction, warm vertical condensation, Thermafil with or without vertical compaction, Obtura, Ultrafil, or Ketac-Endo with a single GP cone. The obturated teeth were allowed to set for 7 days, then exposed to artificial saliva for 10 days, then Pelikan ink for 10 days. The teeth were then decalcified and cleared to observe linear dye penetration.

RESULTS: The teeth with the smear layer removed leaked less. AH-26 leaked less. Vertical compaction of lateral condensation and Thermafil significantly reduced leakage. Ultrafil leaked the most.

C&C: The results of this study indicate that removal of the smear layer will result in decreased coronal leakage regardless of the obturation technique.

August 1997 **Michael J. Mauger**

Takahashi K, MacDonald GD, Kinane DF. Detection of IgA subclasses and J chain mRNA bearing plasma cells in human dental periapical lesions by in situ hybridization. J Endodon 1997;23:513-6.

PURPOSE: To investigate specific mRNAs for IgA subclasses and J chain in human dental periapical lesions by in situ hybridization techniques to assess the involvement of the IgA-associated immune system in these lesions.

M&M: Sixteen granulomas and 8 cysts were studied from patients undergoing apicectomy or tooth extraction. Sections were used for hybridization for J chain mRNA and for IgA subclasses mRNA.

RESULTS: IgA mRNA-positive plasma cells were detected in all sampled tissues. J chain mRNA positive cells were very sparsely detected. The IgA-associated immune response in the PA lesions is more similar to serum or systemic IgA responses than mucosa-associated immune responses where dimeric IgA predominates.

C&C: The immune response of granulomas and cysts is more characteristic of a systemic response than mucosal.

August 1997 **Rodney M. Waite**

Metzger Z, Berg D, Dotan M. Fibroblast growth in vitro suppressed by LPS-activated macrophages. Reversal of suppression by hydrocortisone. J Endodon 1997;23:517-21.

PURPOSE: To test in vitro the effect of activated macrophages on fibroblast growth and report that (a) LPS-activated macrophages profoundly suppress fibroblast's growth, (b) this suppression can be fully reversed by hydrocortisone, and (c) this effect may be achieved even after the activation of the macrophages had taken place.

M&M: Circular fibroblast colonies were formed using a drop containing 7.5×10^5 murine dermal fibroblasts and allowed to grow for 7 days. Activated peritoneal exudate macrophages were added to some of the fibroblasts and LPS-activated macrophages were added to the other fibroblasts. Hydorcortisone was used to reverse the suppression produced by the activated macrophages.

RESULTS: Exudate macrophages and LPS-activated macrophages suppressed the fibroblasts. The suppression was reversible using hydrocortisone.

C&C: A potential may exist for a local pharmaceutical modulation of the equilibrium between fibroblasts and activated macrophages to enhance and speed the healing of the periapical lesion.

August 1997 **Michael J. Mauger**

Alencar AHG, Leonardo MR, Silva LAB, Silva RS, Ito IY. Determination of the P-monochlorophenol residue in the calcium hydroxide + p-monochlorophenol combination used as an intracanal dressing in pulpless teeth of dogs with induced chronic periapical lesion. J Endodon 1997;23:522-4.

PURPOSE: To determine the presence of p-monochlorophenol in the combination of Calen + p-monochlorophenol used as intracanal dressing in pulpless teeth of dogs with induced chronic periapical lesion.

M&M: Four dogs had 60 roots analyzed after 2, 4, 7, and 14 d. Cavities were exposed to saliva for 5 d and when PA lesions formed, the chamber was irrigated with 0.5% NaOCl and the necrotic remnants were removed. The canals were filled with a Ca(OH)2 + p-monochlorophenol paste and the occlusal cavity sealed with IRM. After 2, 4, 7, and 14 d, the dressing was removed and submitted for chemical analysis by spectrophotometry.

RESULTS: A loss of 50% of the p-monochlorophenol occurred in 48h. There was no further significant loss at longer periods, and the medication was still present after 14 d.

C&C: Isn't there a rule about how long a title can be?

August 1997 **Rodney M. Waite**

Dean JW, Lenox RA, Lucas FL, Culley WL, Himel VT. Evaluation of a combined surgical repair and guided tissue regeneration technique to treat recent root canal perforations. J Endodon 1997;23:525-32.

PURPOSE: To evaluate a technique that included retrofill to repair molar root canal perforations and guided tissue regeneration to restore the periodontium that was removed from the furcation area for access to the sites.

M&M: Six dogs had root canal therapy performed on mandibular 4^{th} premolars and 1^{st} molars. The distal roots were intentionally perforated halfway down the canal in each tooth. After obturation of the canal, the accesses were sealed with amalgam and left for one week. The perforations were either repaired a week later with IRM or left unfilled. Some repairs used freeze-dried bone grafts coupled with a Gore-Tex augmentation membrane (GTAM); whereas, some were repaired with a membrane only. The dogs were killed at 6, 12, and 24 weeks. The repair sites were examined radiographically and histologically.

RESULTS: The worst results were in the teeth where the perforation was not filled. The best results were in those teeth, which the perforation was repaired with IRM and GTAM was used. The use of freeze-dried bone did not make a significant difference. When no regenerative materials were used

adjacent to IRM filled perforation repair sites, less healing was observed; healing was proceeding in a normal fashion, but at a slower rate than when the GTAM was used.

C&C: Regenerative membrane seem to speed healing. Bone xenograft does not seem to enhance healing. Failure to fill the perforation site was always associated with unsatisfactory results.

August 1997 **Michael J. Mauger**

Wilcox LR, Roskelley C, Sutton T. The relationship of root canal enlargement to finger-spreader induced vertical root fracture. J Endodon 1997;23:533-4.

PURPOSE: To determine if there is a relationship between root canal enlargement and VRF (vertical root fracture).

M&M: Thirty-four maxillary anterior teeth were transilluminated to eliminate any teeth with fractures or root surface craze lines. Artificial PDLs were fabricated. The canal widths and the total root width were measured at 2 mm, 4 mm, 6 mm, and 8 mm from the apex. The canal widths necessary to produce canal width/total width percentages of 20%, 30%, 40%, and 50% were computed. Each root canal was prepared to 20%, then obturated with gutta-percha using a fine finger spreader with a force of 3.3 kg. The tooth was removed from the socket, transilluminated, and if no fracture, the gutta-percha was removed and the canals were reinstrumented to a measurement of 30% … until 50%. The teeth were sectioned at 2 mm, 4 mm, 6 mm, and 8 mm and examined.

RESULTS: Three teeth were eliminated. Twelve teeth developed VRF, 5 at 40% of root width, 7 at 50%. The remaining 19 teeth all developed craze lines.

C&C: The repeated stressing of the tooth may also accelerate the effects of smaller, long-term stresses from poorly designed final restorations.

August 1997 **Rodney M. Waite**

Rud J, Rud V, Munksgaard EC. Effect of root canal contents on healing of teeth with dentin-bonded resin composite retrograde seal. J Endodon 1997;23:535-41.

PURPOSE: To compare clinical healing results of apical sealing with dentin bonded resin composite (Retroplast) on roots with (1) previous root filling extending to apex after resection, (2) insufficient filling not reaching the apex after resection, and (3) empty, unfilled root canals, consequently containing infectious material.

M&M: 551 teeth were treated surgically with root-end resection and apically sealed Gluma-Retroplast composites. The cases were evaluated at one year and 2- to 4-yr follow-ups for complete bone healing. The position of the root canal fill to the root-end resection was evaluated.

RESULTS: After 2-4 years complete healing was seen in Group 1-92%, Group 2-85% and Group 3-81%. Failures resulted from the composite coming loose or uncovered canals. 76% of the failures were successfully reoperated and converted to complete healing after 1 year.

C&C: This technique may be useful to seal the root-end. Good surgical hemostasis is a must.

August 1997 **Michael J. Mauger**

SEPTEMBER

Friedman S, Torneck CD, Komorowski R, Ouzounian A, Syrtash P, Kaufman A. In vivo model for assessing the functional efficacy of endodontic filling materials and techniques. J Endodon 1997;23:557-61.

PURPOSE: To develop an animal model that involves bacterial ingress into the endodontically filled root canal system in vivo, and to examine its suitability for assessing the efficacy of the endodontic filling in the prevention of posttreatment periradicular inflammation.

M&M: Six premolars in four beagle dogs were used. Access cavities were prepared and the canals enlarged to a size 50 file. Group 1 canals were filled with sealer and laterally condensed gutta-percha, group 2 canals had just gutta-percha without sealer, group 3 had just sealer. The access cavity was sealed with a light-cured glass ionomer, then after 2 w the pulp chamber was inoculated with plaque and the access cavity sealed again. The negative controls were group 4, which had canals filled with the same methods as in groups 1, 2, and 3. Group 5 had prepared canals left unfilled. The access cavities were not inoculated in groups 4 and 5. The positive controls (group 6) had prepared canals unfilled, but access cavities inoculated with plaque. The treated teeth were examined to monitor development of periradicular periodontitis at 3, 6, and 11 w after inoculation. At 14 w the dogs were killed, the jaws block dissected, decalcified, embedded, sectioned, stained and examined under light microscope. Periradicular inflammation was rated.

RESULTS: Groups 2, 3, and 5 had periradicular rarefying osteitis initially noted at 11 w and better defined at 14 w. Group 4 showed the lowest frequency of inflammation and group 6 the highest frequency. Bacterial colonies were observed in the canals of 92% of the roots with severe inflammation and in none of the roots that demonstrated mild inflammation. None of groups 1, 2, and 3 differed significantly from each other.

C&C: These results showed an increased incidence of endodontic treatment failure with inadequate occlusal restoration and demonstrated that just a few weeks were sufficient for coronal bacterial ingress to induce endodontic treatment failure. This in vivo model may be used to assess the efficacy of current endodontic filling materials and techniques and to provide a basis for their evolution.

September 1997 **Rodney M. Waite**

Jimenez-Rubio A, Sequra JJ, Llamas R, Jimenez-Planas A, Guerrero JM, Calvo JR. In vitro study of the effect of sodium hypochlorite and glutaraldehyde on substrate adherence capacity of macrophages. J Endodon 1997;23:562-4.

PURPOSE: To study if sodium hypochlorite and glutaraldehyde solutions could modulate macrophage function.

M&M: 5.25% sodium hypochlorite and 1% glutaraldehyde, or 1% EDTA was added to a final dilution of 1:10, 1:100, or 1:1000 in the incubation medium of macrophages. Adherence assays were performed at 15 min of incubation at 37 degrees C in a humidified atomsphere of 5% CO2 to provide a maximal adherence index.

RESULTS: Sodium hypochlorite and glutaraldehyde significantly decreased the adhesion of macrophages, but were less potent than was the EDTA.

C&C: The apical extrusion of sodium hypochlorite and glutaraldehyde during the root canal therapy could modify macrophage functions modulating reparative mechanisms and decreasing inflammatory reactions in periapical tissues.

September 1997 **Michael J. Mauger**

Delzangles B, Boy-Lefevre M, Forest N. Glycoproteins expression in apical pathologic tissues: clinical incidences. J Endodon 1997;23:565-8.

PURPOSE: To analyze, using indirect immunofluorescence, the localization and distribution of the primary collagens, fibronectin and laminin, in granulomas and cysts

M&M: 160 extracted teeth with periapical lesions and pulp necrosis as the etiology were examined. One quarter of the lesion was reserved for histological examination and ¾ for indirect immunofluorescence. Differentiation between cysts and granulomas was made. Antibodies against type I, III, IV, and V collagens, as well as fibronectin and laminin were exposed to the lesions and sections were observed with a fluorescence microscope.

RESULTS: The granulomas were surrounded by a fibrous capsule and types I, III, IV and V collagens were present more at the external of the encapsulated area as compared with the center of the lesion. The cysts had type I, III, IV and V collagens present. There was an intense presence of type IV collagen in the membrane of the cyst. Fibronectin was compact in the cyst and more disorganized in the granuloma.

C&C: We still can't differentiate between granulomas and cysts clinically.

September 1997 **Rodney M. Waite**

Inoue H, Muneyuki H, Izumi T, Taguchi K, Nishigawa Y, Watanabe K, Ohkawa Y, Tamura N. Electron microscopic study of nerve terminals during dentin bridge formation after pulpotomy in dog teeth. J Endodon 1997;23:569-71.

PURPOSE: To examine the relation of pulpal nerves to the differentiation of pulpal cells into preodontoblasts and odontoblasts in the healing process after pulpotomy.

M&M: 36 upper and lower canines and molar teeth from 6 adult dogs had pulpotomies of the coronal pulps preformed. The amputated pulps were capped with calcium hydroxide paste, and each cavity was lined with glass ionomer cement and filled with amalgam. The interval between pulpotomy and extraction was 5, 7, 10, 15, 20, 30, 40, 50, and 60 days. The pulps were stained and prepared for histological evaluation.

RESULTS: A close contact between fibroblast-like cells/osteoblast-like cells and nerve terminals at the calcification front were observed in the early healing process after pulpotomy.

C&C: A close relation between nerve fibers and cell differentiation suggests a neurotrophic effect regulating pulpal cell differentiation after pulpotomy.

September 1997 **Michael J. Mauger**

Beltes P, Koulaouzidou E, Kolokuris I, Kortsaris AH. In vitro evaluation of the cytotoxicity of two glass-ionomer root canal sealers. J Endodon 1997;23:572-4.

PURPOSE: To assess the cytotoxicity of Ketac-Endo and Endion by using a n established cell line.

M&M: Ketac-Endo and Endion, a newly proposed glass ionomer sealer, were mixed and placed on petri dishes under aseptic conditions. Hamster kidney fibroblasts were cultured in Eagle's medium and covered each petri dish. Incubation of all dishes was at 37^0C and concluded after 24, 48, and 72 h. The viable cells were counted.

RESULTS: Ketac-Endo cells were normal in appearance and the Endion cells were apparently dead or dying. Endion was highly cytotoxic with a significant difference compared to Ketac-Endo at three observation periods.

C&C: Ketac-Endo proved to be the most biocompatible material.

September 1997 **Rodney M. Waite**

Yared GM, Bou Dagher F. Evaluation of lidocaine in human inferior alveolar nerve block. J Endodon 1997;23:575-8.

PURPOSE: To measure the degree of anesthesia following an IAN block with 3.6 ml of the lidocaine with varying amounts of epinephrine.

M&M: 30 adult subjects average age of 32 were used for this study. At 3 successive appointments at least 1 week apart, the patients were anesthesized with 3.6ml of 2% lidocaine with either 1:50,000, 1:80,000 or 1:100,000 epinephrine. Mandibular right and left sides were tested with the first molar, first premolar, and lateral incisor chosen as the test teeth. The contralateral canine was tested as the unaesthetized control. The teeth were pulp tested with an EPT before and after anesthesia. The injection and testing were done in a blinded fashion to prevent bias. The level and maintenance of anesthesia was monitored for 50 min.

RESULTS: All three solutions tested were comparable in their effectiveness to obtain anesthesia.

C&C: Feel free to use any concentration of epinephrine to obtain pulpal anesthesia.

September 1997 **Michael J. Mauger**

Lee CQ, Chang Y, Cobb CM, Robinson S, Hellmuth EM. Dimensional stability of thermosensitive gutta-percha. J Endodon 1997;23:579-82.

PURPOSE: To quantitatively analyze the expansion and shrinkage rates of four commercially available brands of thermosensitive endodontic gutta-percha for their volumetric stability under highly controlled conditions.

M&M: A volume dilatometric analysis technique was used to measure the expansion and shrinkage of Regular Flow Plugs, Easy Flow Plugs, Ultrafil, and Thermafil. The volume of each individual experimental sample was determined by the displacement of water. The range of temperature for this experiment was 24^0C to 80^0C using a water bath. The initial height of the mercury column was then measured and recorded. The dilatometer system was gradually heated to 80^0C and the height of mercury measured at every 2^0C increment. The system was cooled to room temperature (24^0). A different sample was heated to 80^0C but then cooled to body temperature (37^0C). Expansion and shrinkage rates were calculated. The entire experiment was repeated four times for each product.

RESULTS: Expansion and/or shrinkage in volume of the gutta-percha specimen was the same among all samples. At 80^0C, Ultrafil Plugs exhibited the greatest expansion (+12.2%) and shrank the least (-2.2%). After the 24^0 - 80^0 - 37^0C cycle, the final percentage volume increase for Ultrafil Plugs was the greatest (+7.2%) among the four products.

C&C: Ultrafil shrank < Thermafil < Easy Flow < Regular Flow, but they were all very close.

September 1997 **Rodney M. Waite**

Blum J, Michailesco P, Abadie MJM. An evaluation of the bactericidal effect of the Nd:YAP laser. J Endodon 1997:23:583-5.

PURPOSE: To assess, in vitro, the antibacterial effectiveness of the Nd:YAP laser.

M&M: 30 single rooted teeth had the crowns removed and were prepared to a size #20 at the apex. The teeth were then sterilized, inoculated with a bacteria, and divided into experimental groups with controls. In one group, the canal was instrumented up to a size #30 file using 5.25% sodium hypochlorite irrigation. The other groups were instrumented to the same size but rather than using sodium hypochlorite saline was used then the canal was lased at either 5, 10, or 30 Hz. After the experimentation, the residual colonies were counted.

RESULTS: Both NaOCl and high-frequency (30 Hz) Nd:YAP laser effectively inhibited the growth of the bacteria.

C&C: Why bother with the laser, if the NaOCl will do as good a job with less expense and potential for problems?

September 1997 **Michael J. Mauger**

Ramirez-Salomon M, Soler-Bientz R, de la Garza-Gonzalez R, Palacios-Garza C. Incidence of lightspeed separation and the potential for bypassing. J Endodon 1997;23:586-7.

PURPOSE: To determine the frequency of separation of Lightspeed instruments and their ability to be by-passed during clinical usage in molar teeth.

M&M: Fifty-two maxillary and mandibular first molars of patients were instrumented by three endodontists. The canals were then cleaned and shaped with the Lightspeed instruments and prepared to at least a size 45 at the WL, then stepped-back 1 mm for each half size. When the instrument separated, the size and number of times the instrument had been used were recorded.

RESULTS: One hundred sixty-two canals were prepared. Six instruments separated, five of which could be bypassed. The instruments had been used in 11 to 13 molars before they fractured, and all fractured right behind the blade.

C&C: Lightspeed didn't separate much and when it did, it was easy to by-pass.

September 1997 **Rodney M. Waite**

Chau JYM, Hutter JW, Mork TO, Nicoll BK. An in vitro study of furcation perforation repair using calcium phosphate cement. J Endodon 1997;23:588-92.

PURPOSE: To determine the sealing ability of calcium phosphate cement (CPC) when used as a furcation repair material and assess the effect a CPC matrix has on light-cured glass ionomer cement placed as a furcation perforation repair material.

M&M: 40 maxillary and mandibular molars had uniform furcation perforations made with a #2 round bur. The teeth were then divided into 3 experimental groups and positive and negative control groups. Group 1 had the perforations repaired with CPC, Group 2 repaired with Vitrebond, and Group 3 was repaired with a CPC matrix covered with Vitrebond. The teeth were then placed into India ink for 48 hours and sectioned longitudinally. The linear dye penetration was measured.

RESULTS: There was no statistical significant difference in the leakage between the 3 groups. All groups demonstrated significant dye penetration. There was a statistical significant amount of material extruded into the furcation in the CPC group.

C&C: CPC may be biocompatible but when used as a furcation repair material it leaks.

September 1997 **Michael J. Mauger**

Chan C, Chang S, Huang C, Wu SK, Kuang S. Cutaneous sinus tract caused by vertical root fracture. J Endodon 1997;23:593-5.

PURPOSE: To present a case of cutaneous sinus tract originated from a fractured root caused by trauma.

SUMMARY: A 37 yo male had a CC of recurrent facial sinus tract and purulent discharge on the left cheek. He was hit in the area by a cow 3 y earlier. Two y later, a sinus tract with recurrent purulent discharge appeared on the left cheek near the mandibular border. Surgical removal of this sinus tract was performed 4 to 5 times by physicians and surgeons. Traditional Chinese herb medicine was also tried. All of them failed. A M - D crack line was noted on the occlusal surface of the lower left molar. Vitality tests were negative. An abrupt 12 mm deep pocket was found at the ML side. PA radiographs revealed an obvious vertical root fracture and a lucent lesion around the fractured root. The tooth was extracted and 1 m later both the extraoral sinus tract and the intraoral fistula were completely resolved.

September 1997 **Rodney M. Waite**

OCTOBER

Blum J, Esber S, Parahy E, Franquin J. Effect of masticatory cycles on tooth compression and resultant leakage of amalgam retrofills. J Endodon 1997;23:605-9.

PURPOSE: To investigate the effect of tooth structural changes due to masticatory cycles on the sealing ability of retrofilled amalgam inserted into cavities of different depths.

M&M: 40 extracted maxillary molars had root-end preparations and fillings placed into the palatal roots. In group A, the amalgam filling was 1.5mm thick. In group B, it was 3mm and in group C, no root-end filling was placed. The teeth were then mounted in a cast with other extacted teeth to complete the full arch of maxillary and mandibular teeth. With a strain gauge attached to the palatal root, a masticatory device with occlusion force of 30 kg was used to simulate opening and closing for cycles of 500,000, 1 , 2, and 3 million. The palatal roots were then separated from the buccal roots and placed in methylene blue dye and longitudinal dye leakage was measured through grooves in the buccal and lingual sides of the root using a stereomicroscope.

RESULTS: The leakage increased in correlation with the number of masticatory cycles. Leakage was less for the deeper cavity restorations at all stages.

C&C: This study would tend to suggest that mastication over time will cause root compression and lead to leakage of the root-end filling. However, the study design did not account for the shock absorption related to the PDL in vivo and therefore this study is flawed.

October 1997 **Michael J. Mauger**

Chailertvanitkul P, Saunders WP, MacKenzie D. Coronal leakage of obturated root canals after long-term storage using a polymicrobial marker. J Endodon 1997;23:610-3.

PURPOSE: To investigate the leakage of two species of microorganisms into root canals obturated with lateral condensation of cold gutta-percha and either of two root canal sealers, after long-term storage in artificial saliva.

M&M: Sixty extracted teeth had root canals prepared and irrigated with 2% NaOCl. Twenty teeth were obturated with lateral condensation of cold gutta-percha using Apexit and 20 with Tubliseal EWT. Ten teeth were negative controls using either sealer and ten were not obturated. Specimens were put into artificial saliva for 6 mon, the crowns removed, and the teeth placed on the leakage apparatus. Contamination of S. sanguis and P. intermedia was detected by the broth becoming turbid.

RESULTS: Leakage reached the apex at 17 to 88 d; 50% and 70% of the specimens of the Apexit and Tubliseal EWT groups showed leakage at 90 d. No difference in leakage between the two sealers.

C&C: Lateral condensation of cold gutta-percha with two different sealers was unable to prevent coronal ingress of a mixed flora used as a leakage marker.

October 1997 **Rodney M. Waite**

Kaufman D, Mor C, Stabholz A, Rotstein I. Effect of gutta-percha solvents on calcium and phosphorus levels of cut human dentin. J Endodon 1997;23:614-5.

PURPOSE: To assess histochemically the effect of chloroform, xylene, and Endosov-E on the calcium and phosphorus levels of cut human dentin surface.

M&M: 80 specimens were cut from 10 freshly extracted teeth and divided into 6 experimental and 2 control groups of 10 specimens each. Each experimental group was treated for 15 or 30 min with one of the following gutta-perch solvent: chloroform, xylene, or Endosolv-E. Levels of calcium and phosphorus in the dentin surface of each specimen were measured using a JSM-840A scanning electron microscope and an AN1000 energy dispersive spectometer.

RESULTS: There was minimal changes in the calcium and phosphorus levels in each of the groups.

C&C: These solvents have minimal effect on dentin.

October 1997 **Michael J. Mauger**

Shalhav M, Fuss Z, Weiss EI. In vitro antibacterial activity of a glass ionomer endodontic sealer. J Endodon 1997;23:616-9.

PURPOSE: To evaluate the antibacterial properties of Ketac Endo (KE) and compare it to Roth's cement (RC).

M&M: An agar diffusion test (ADT) and direct contact test (DCT) were used to evaluate the antibacterial activity. Samples were used within 20 min, were allowed to set 24 h before testing or were allowed to set 48 h then aged in phosphate buffer saline 1 w. E. faecalis was used.

RESULTS: The ADT showed freshly mixed KE exhibited a twofold greater inhibition zone than RC. In the DCT, freshly mixed KE and RC completely inhibited bacterial growth. The 24 h and 7 d samples of KE showed no antibacterial activity, whereas RC continued to exhibit a strong effect.

C&C: KE possesses a short-acting very potent and diffusable antibacterial activity, whereas RC extends its effect over 7 d after setting.

October 1997 **Rodney M. Waite**

Bae K, Baumgartner JC, Shearer TR, David LL. Occurrence of prevotella nigrescens and prevotella intermedia in infections of endodontic origin. J Endodon 1997;23:620-3.

PURPOSE: To investigate he occurrence of *P. intermedia* and *P. nigrescens* in endodontic infections using sodium dodecyl sulfate polyacrylamide gel electorphoresis to differentiate the two species.

M&M: 56 strains of black pigmented bacteroides from endodontic infections were identified as *P. intermedia*. The bacteria were lysed and the proteins were separated using SDS-PAGE electophoresis to distinguish the *P. intermedia* from *P. nigrescens* in the bacteria originally identified as *P. intermedia.*

RESULTS: Of the 56 strains of BPB, 41 (73.2%) were identified as *P. nigrescens* and 15 (26.8%) as *P. intermedia*.

C&C: Most BPB from endodontic infections are *P. nigrescens* and not *P. intermedia* as originally thought.

October 1997 **Michael J. Mauger**

Min MM, Brown CE, Legan JJ, Kafrawy AH. In vitro evaluation of effects of ultrasonic root-end preparation on resected root surfaces. J Endodon 1997;23:624-8.

PURPOSE: To investigate if the use of ultrasonics in root-end preparations causes surface and structural alteration to the resected root surface.

M&M: Forty extracted molars were instrumented and obturated with laterally condensed gutta-percha and Roth sealer. The apical 3 mm of each root was resected with diamond discs. Four groups of 10 teeth were: control, root ends prepared with a microhead handpiece and #33 1/3 bur to a depth of 2 mm, root-end preparations using EIE ultrasonic tips at the lowest and level 5 setting to a depth of 2 mm. All root ends were sealed with Super EBA. Fluorescent dye staining of the root surfaces then examination with confocal microscopy preceded histologic examination.

RESULTS: There was no significant difference between the groups in the number and length of the fractures as viewed with confocal microscopy. Histologic data indicated that root ends prepared by ultrasonics had a statistically greater number of fractures than both the control and the conventionally prepared groups.

C&C: A trend was noted of increasing number of fractures in the ultrasonics groups. Statistically there was no significant difference between the two ultrasonic groups, but the higher level had the most fractures observed.

October 1997 **Rodney M. Waite**

Lussi A, Suter B, Grosrey J. Obturation of root canals in vivo with a new vacuum technique. J Endodon 1997;23:629-31.

SUMMARY: To present a procedure by which the necessary vacuum can be produced in root canals in vivo, thus allowing the obturation of canals with the vacuum filling technique. This article shows the building up of a broken down molar with composite in which is placed a nozzle into the pulp chamber. A 15hPa vacuum is created inside of the pulp space and a filling paste (AH 26 plus) was sucked into the root canal by the vacuum.

C&C: This technique does not look practical.

October 1997 **Michael J. Mauger**

Wolcott J, Himel VT, Powell W, Penney J. Effect of two obturation techniques on the filling of lateral canals and the main canal. J Endodon 1997;23:632-5.

PURPOSE: To compare the ability of cold lateral condensation and a gutta-percha coated rigid carrier technique to obturate the main and lateral canals of the root canal system.

M&M: Thirty epoxy blocks with a single #50 main canal and five lateral canals were used. Group 1 canals were obturated with a cold lateral condensation technique and sealer. Group 2 was treated with a gutta-percha coated rigid carrier technique, sealer and backfilling the coronal aspect with additional gutta-percha. The blocks were stored at room temperature and 100% humidity for 7 d. The length of gutta-percha and sealer in each of the lateral canals was then measured. The blocks were then sectioned and void spaces determined.

RESULTS: There was significantly more gutta-percha in the lateral canals with the gutta-percha coated rigid carrier technique. The cold lateral condensation technique had significantly more sealer in the lateral canals. There was no significant difference between gutta-percha - sealer filling of the lateral canals between the techniques. Fewer voids with the gutta-percha coated rigid carrier technique were noted at the 1 mm level of the main canal.

C&C: Both techniques were equally effective in filling lateral canals. In filling the main canal, the coated rigid carrier technique was more effective.

October 1997 **Rodney M. Waite**

Canalda-Shali C, Berastegui-Jimeno E, Brau-Aguade E. Apical sealing using two thermoplasticized gutta-percha techniques compared with lateral condensation. J Endodon 1997;23-636-8.

PURPOSE: To compare the apical sealing capacity of multiphase gutta-perch obturation technique, JS Quickfill, and lateral gutta-percha condensation.

M&M: 70 maxillary anterior teeth with straight canals were all instrumented in a standardized step-back manner, then obturated with either multi-phase gutta-percha obturation, JS Quickfill, or lateral condensation. The groups were placed into India ink for 48 hours then the teeth were cleared to show dye leakage.

RESULTS: None of the groups leaked significantly. All had excellent sealing capablilities.

C&C: These newer thermoplasticized techniques appear to successfully obturate root canals in large, straight roots.

October 1997 **Michael J. Mauger**

Mannocci F, Vichi A, Ferrari M. Sealing ability of several restorative materials used for repair of lateral root perforations. J Endodon 1997;23:639-41.

PURPOSE: To compare by dye leakage test, the sealing ability of some new generation dentin-enamel bonding systems and composite materials with that of amalgam and IRM in lateral perforations experimentally induced in the coronal third of extracted human teeth.

M&M: Eighty-five extracted molars were used. After access a perforation was then made. The teeth were placed in silicone blocks to create a pocket, were kept wet and were divided into 5 groups of 15 teeth: Group 1 had amalgam filling the perforation; group 2 had IRM, group 3 had Vitremer; group 4 had Bisfil 2B; group 5 had Ana-Norm Liner. The teeth were kept in saline solution for 4 w, then placed in methylene blue dye.

RESULTS: All experimental groups demonstrated dye penetration to varying degrees. Bisfil 2B leaked significantly less than the other four materials. Vitremer and IRM leaked significantly less than amalgam and Ana Norm Liner. Bisfil 2B showed the highest rate of overfilling followed by amalgam and Ana Norm Liner. Vitremer showed the highest rate of underfilling.

C&C: In the Bisfil 2B group, a self-curing material was used in combination with a dual curing adhesive. This could explain the good results.

October 1997 **Rodney M. Waite**

NOVEMBER

Iwanowski RJ, Torneck CD. ^{3}H proline uptake in the tubular compartment of dentin in the rat molar. J Endodon 1997;23:659-62.

PURPOSE: To determine whether the tubular compartment of normal rat molar dentin captures ^{3}H proline and to determine whether there was any increase in ^{3}H proline capture and whether increased collagen deposition occurred as a reparative mechanism following mechanical, rather than pathological, stimulation of dentin.

M & M: ^{3}H proline has been used to demonstrate the synthesis and secretion of collagen by odontoblasts during dentinogenesis. Expt. 1 was ^{3}H proline capture by normal dentin. Four rats were given injection of proline and killed at intervals of 4, 8, 72, and 96 h. The maxillae were removed, decalcified and sectioned for radioautographic processing. Counts were made over mineralized dentin, mineralized alveolar bone, sclerosed dentin and the emulsion near the MB cusp (background). Expt. 2 was ^{3}H proline capture following cavity preparation. Eight rats had a cavity prepared into the outer third of dentin and filled with bone wax one h after injection of the proline. The rats were killed at 1, 2, 6, and 24 h. Expt. 3 was a TEM study of similar rats as in expt 2.

RESULTS: ^{3}H proline uptake was readily demonstrated in the odontoblasts and in predentin. The uptake in normal dentin was significantly greater than in sclerosed dentin, alveolar bone and background. There was an increase in the uptake over affected dentin (under the cavity) as compared to normal dentin. Dentinal tubules beneath the cavity displayed large collagen bundles.

C&C: Labeled proline is captured by the odontoblast and subsequently incorporated into the procollagen molecule, which is secreted into the organic matrix of predentin. The odontoblastic processes play a role in the determination of the contents of tubular dentin.

November 1997 **Rodney M. Waite**

Arnold JW, Rueggeberg FA, Anderson RW, Weller RN, Borke JL, Pashley DH. The disintegration of SuperEBA cement in solutions with adjusted pH and osmolarity. J Endodon 1997;23:663-8.

PURPOSE: To determine the disintegration of fast-set SuperEBA cement using Spec #30 in addition to modifications in pH, osmolarity, and duration of immersion that mimic the clinical periapical environment and common surgical technique.

M&M: SuperEBA was mixed and placed into solutions of varying osmolarity and pH. The specimen were immersed for intervals of 24h, 1wk, 1m, 3m, and 6m. The preimmersion and postdehydration weights were obtained and the percent weight loss from preimmersion levels was calculated.

RESULTS: The SuperEBA disintegrated progressively over time. This disintegration was significantly increased by adjusting the pH of the storage solution and by increasing the duration of immersion. The lower the pH the more disintegration. Adjusting the osmolarity of solution to physiological levels resulted in a significant decrease in measured disintegration. A set-time of 10 min before immersion had no significant effect on the measured weight loss of material as compared to the 1h set-time.

C&C: SuperEBA clinically has been shown to be an effective root-end filling material.

November 1997 **Michael J. Mauger**

Blum J, Abadie MJM. Study of the Nd:YAP laser. Effect on canal cleanliness. J Endodon 1997;23:669-75.

PURPOSE: To investigate the usefulness of the Nd:YAP laser in endodontic preparations.

M & M: The active medium of the laser is yttrium aluminum perovskite, with ions of neodymium. Two different diameter fibers were used. Fifty extracted max. molars were accessed and irrigated with 2.5% NaOCl. Group A had serial preparation with manual instrumentation. Group B had preparation with the Nd:YAP laser. Group C had manual instrumentation with laser as an adjunct. Group D had manual instrumentation and subsonic instrumentation with the MM 300. Group E had manual instrumentation with subsonic and laser as adjuncts. Debris, particle size, opened tubules and conicity were rated after viewing under an SEM.

RESULTS: For laser preparation, there was little increase in canal diameter and a substantial amount of debris was present. The differences between A, C, and D were not significant. E showed the cleanest preparation with very little debris.

C & C: It seems like they really wanted the laser to work, so they invented a group where the laser was sure to look good.

November 1997 **Rodney M. Waite**

Olson BD, Maihot JM, Anderson RW, Schuster GS, Weller RN. Comparison of various transport media on human periodontal ligament cell viability. J Endodon 1997;23:676-9.

PURPOSE: To compare the suitability of a variety of transport media on the viability of PDL cells over several time periods.

M&M: PDL cells were cultured from healthy extracted third molars and premolars. The cells were placed into 24 well culture plates containing milk, Save-a-Tooth, Save-a-Tooth supplemented with platelet-derived growth factor-BB (PDGF), or Gatorade. Positive and negative controls were used. Cell viability was determined using an MTS assay and an ELISA plate reader to determine optical density.

RESULTS: Gatorade was effective in damaging the PDL cells. Milk was found to be as good or better than the other solutions tested up to 12h. The addition of PDGF to the Save-a-tooth had a stimulatory effect on the cells and was able to increase the number of viable cells present.

C&C: Milk and Save-a-tooth are good transport media. Save-a-Tooth with PDGF is better. Gatorade bad; very bad.

November 1997 **Michael J. Mauger**

Pantelidou O, Lyroudia K. SEM examination of secondary dentine under and opposite cervical carious lesions. J Endodon 1997;23:680-2.

PURPOSE: To examine secondary (reparative) dentine under cervical carious lesions of human teeth and the calcified depositions on the opposite side of the dentinal walls.

M & M: Twenty vital teeth with a cervical carious lesions that had not clinically reached the pulp chamber were studied. They were cleaned and fractured, then evaluated under the SEM.

RESULTS: Dentin underlying the carious lesions had a complete disappearance of the dentinal tubules, had globular deposits of mineralized secondary dentine, and had mineralized deposits of fibrous morphology. Dentine opposite the carious lesions was homogeneous, typical of secondary dentine.

C & C: Reparative dentin (the correct term, rather than secondary dentin) may not be able to seal off the advancing carious attack due to its structure.

November 1997 **Rodney M. Waite**

Altshul JH, Marshall G, Morgan LA, Baumgartner JC. Comparison of dentinal crack incidence and of post removal time resulting from post removal by ultrasonic or mechanical force. J Endodon 1997;23:683-6.

PURPOSE: to compare the frequency of canal and intra-dentin cracks after intra-radicular post removal using ultrasonic instrumentation or the Gonan post removal system.

M&M: Sixty teeth in cadavers had their crowns removed at the cemento-enamel junction using a high speed drill with a fissure bur. The teeth were treated endodontically and divided into four groups of 15 teeth each. Paraposts (#4) were placed into three of the groups to a depth 7 mm apical to the cemento-enamel junction and luted with ZnPO4 cement. The cement was allowed to set for 1 week. Group 1 had posts removed using a Bobcat cavitron with a standard tip (Ultrasonic Group) tip was applied only to the post. Group 2 had posts removed using the Gonan post removal system (Gonan Group). Group 3 did not have the posts removed (Post Group). Group 4 had no posts placed (No Post Group). Groups 1 and 2 were contra-lateral matched pairs of teeth. The time required for post removal in groups 1 and 2 was recorded. The teeth were removed atraumatically from cadavers and sectioned using an Isomet ultra low speed saw at 4 mm, 7 mm, and 10 mm. The teeth were then examined using a zoom stereo-microscope at 20-63X. Canal and intra-dentin cracks were mapped and their frequency recorded at each level.

RESULTS: There were statistically more cracks present in the ultrasonic group than the no post group. There were no other differences that reached statistical significance. It took significantly longer for post removal using the ultrasonic tip versus the Gonan system.

C&C: The significance of these cracks are not known; however they may be a potential for production of vertical root fractures.

November 1997 **Michael J. Mauger**

Harkacz OM, Carnes DL, Walker WA. Determination of periodontal ligament cell viability in the oral rehydration fluid Gatorade and milks of varying fat content. J Endodon 1997;23:687-90.

PURPOSE: To determine if the oral rehydration fluid Gatorade could serve as a suitable temporary storage medium for maintenance of PDL cell viability on avulsed teeth and to compare milk of varying fat content to determine if fat content is related to maintenance of cell viability.

M & M: Cultures of human periodontal ligament cells were obtained from freshly extracted teeth. The specimens were placed into petri dishes containing Eagles medium and cultured. The medium was replaced with the experimental solutions: skim milk, 0.5% milk, 2% milk, whole milk and Gatorade, then assayed for cell viability.

RESULTS: Gatorade did not support the maintenance of PDL cell viability, showing a similar decrease in cell population as tap water. PDL cells maintained in either skim or 0.5% milk demonstrated consistently greater viability than in milks having a 1% or greater fat content. Gatorade was more acidic than the other solutions and had the highest osmolality. The values for the milk solutions were within physiologic range, while saliva and tap water were hypotonic.

C & C: Gatorade is bad, low fat milk is good.

November 1997 **Rodney M. Waite**

Liu H, Lin C, Lan W. Sealing depth of Nd:YAG laser on human dentinal tubules. J Endodon 1997;23:691-3.

PURPOSE: To evaluate, under a scanning electron microscope, the sealing depth of Nd:YAG laser on human dentinal tubules.

M&M: From 9 intact molars, 36 dentin specimen were obtained. The samples were divided into 3 groups. Group A and B were lased by Nd:YAG laser at 30 mJ with 10 pulses/sec for a stroke along the dentin surface. Group C was not lased . Group B was then frozen in liquid nitrogen and split. The specimen were then examined using a SEM.

RESULTS: The sealing depth of Nd:YAG laser on human dentinal tubules was about 4 microns in the center and 3 microns at the margin of the lased surfaces.

C&C: It was suggested that lasing dentin will help reduce dentinal sensitivity by occluding the tubules.

November 1997 **Michael J. Mauger**

Eli I, Bar-Tal Y, Silberg A. Effect of intended treatment on anxiety and on reaction to electric pulp stimulation in dental patients. J Endodon 1997;23:694-7.

PURPOSE: To compare the anxiety level caused to patients by different dental treatments and its effect on their report on pain during pulp stimulation by electric pulp test.

M & M: Ninety-two patients were assigned into 4 groups: calculus removal, routine restorative treatment, RCT and tooth extraction. To assess their level of anxiety, patients completed questionnaires. Each patient was subjected to electric tooth pulp stimulation on the max. right incisor using an EPT. Following stimulation, each patient was asked to indicate their subjective report as to the experienced pain.

RESULTS: Patients differed significantly in their measures of anxiety according to the treatment they were about to receive, with tooth cleaning as the least anxiety arousing, followed by filling, RCT, and tooth extraction. Dental anxiety decreased the threshold of patients who expected easier treatments, but increased the threshold of those who expected more stressful treatments.

C &C: I would have expected, along with the authors, that an anxious person with a high expectation of pain would have a lower threshold for pain, but that wasn't the case.

November 1997 **Rodney M. Waite**

Thompson SA, Dummer PMH. Shaping ability of lightspeed rotary nickel-titanium instruments in simulated root canals. Part 1. J Endodon 1997;23:698-702.

PURPOSE: To determine the ability of Lightspeed nickel-titanium rotary instruments to shape simulated canals in resin blocks.

M&M: 40 canals with varying degree of curvature from 20-40 degrees and sharp or gentle curves were constructed in resin blocks. Each of the canals was instrumented using Lightspeed rotary instruments up to an apical prep size of #35. The instruments were used four times before being replaced. The step-back was made at 1mm increments with instruments up to size #70. The canals were assessed for preparation time, instrument failure, canal blockage, loss of working length, canal form, apical stop, smoothness, grooves, flow, and taper.

RESULTS: The mean preparation time was 8.12 min. No instruments separated. 17 canals retained their working length, 16 gained length, and 7 lost length. Apical stops were present in only 23 canals and these were of poor quality. All canals had poor taper characteristics. The apical canal was smooth in 36 of 40 canals.

C&C: The poor flow of the Lightspeed preparations was attributed to the ineffective step-back procedure. Not a favorable article on the Lightspeed technique.

November 1997 **Michael J. Mauger**

Weller RN, Kimbrough WF, Anderson RW. A comparison of thermoplastic obturation techniques: adaptation to the canal walls. J Endodon 1997;23:703-6.

PURPOSE: To compare the ability of the Thermafil technique, using the three different types of carriers, to obturate a standardized root canal and compare it with the Obtura II and lateral condensation techniques.

M & M: A split-tooth model was used. The root canal was cleaned and shaped using a step-back preparation to a size 60 file. Root canal irregularities were artificially produced. Twenty obturations were performed in the model without sealer for each of the techniques evaluated. The manufacturers' recommended procedures were followed. Group 1 was Thermafil with a stainless steel carrier. Group 2 was Thermafil with a plastic carrier. Group 3 was Thermafil with a titanium carrier. Group 4 was Obtura II and group 5 was lateral condensation. The M and D sides of each obturation were examined with an operating microscope. The quality of the obturations was evaluated by: replication to working length, replication of the artificial depressions, voids and homogenicity of obturation.

RESULTS: Obtura II demonstrated the best adaptation, followed by Thermafil plastic, titanium, stainless steel and lateral condensation. All three Thermafil groups showed incomplete extension of the gutta-percha to the working length.

C & C: Lateral condensation didn't look too good compared to the other techniques.

November 1997 **Rodney M. Waite**

Huelsmann M. A maxillary first molar with two disto-buccal root canals. J Endodon 1997;23:707-8.

SUMMARY: This article is a case report of a maxillary molar with two disto-buccal canals. At first the dentist thought that the second orifice was a perforation site. No MB2 canal was found. The finding of two DB canals is rare. I liked his "best of a series" cone cut film.

November 1997 **Michael J. Mauger**

DECEMBER

Pilot TF, Pitts DL. Determination of impedence changes at varying frequencies in relation to root canal file position and irrigant. J Endodon 1997;23:719-24.

PURPOSE: To investigate the in vivo changes in electrical impedance at different locations in the root canal system using multiple signal frequencies and various canal irrigants.

M&M: Ten anterior or premolar teeth in 10 patients with one canal and no metallic restorations were used. The canals were broached then radiographic working length was established. A series of test K-file handles were locked at varying lengths of 3mm short to 0.5mm long of the foramen. Six different frequencies were used at each different level, as well as 6 different canal conditions (RC Prep, 70% isopropyl alcohol, Dry canal after isopropyl alcohol, 14.45% EDTA sodium solution, 0.9% sterile normal saline, 5.25% NaOCl, and Dry canal after NaOCl irrigation) and samples of impedance were taken using a Sono Explorer Mark IV apex locator.

RESULTS: The least conductive irrigant yielded the smallest prediction error. RC prep, isopropyl alcohol, and dry canal gave the most reliable readings. No significant difference was noted in prediction error at different frequencies.

C&C: Small sample size; however it appears that using a non-conductive irrigant gives a greater difference in impedance, thus allowing a greater prediction of file position in relation to the foramen.

December 1997 **Michael J. Mauger**

Berutti E, Marini R, Angeretti A. Penetration ability of different irrigants into dentinal tubules. J Endodon 1997;23:725-7.

PURPOSE: To verify the capability of NaOCl alone, or in combination with EDTA plus a tensioactive agent, to penetrate the dentinal tubules of the root canal during endodontic instrumentation, and thus exercise its bactericidal and solvent actions inside the dentinal tubules.

M&M: Twenty-four extracted central incisors were accessed and had pulp extirpated, then were sterilized in ethylene oxide. Pulp canals were inoculated with S. faecalis. All teeth were instrumented apically up to #40. Group A used 5% NaOCl irrigation with a flush of 10% EDTA and a final flush of physiologic solution. Group B used 10% EDTA irrigation, then 1% Triton X-100, then 5% NaOCl and a final flush of physiologic solution. All specimen were dehydrated, sectioned longitudinally and examined.

RESULTS: Tubular infection extended to a depth of 300 μm in group A and showed an area of dentin free from tubular infection that extended to an average 130 μm from the canal lumen in group B

C&C: The tensioactive agent lowered the surface tension and prepared the canal walls for the NaOCl; some of the NaOCl might be sucked into the dentinal tubules by capillary action.

December 1997 **Rodney M. Waite**

Llamas R, Segura JJ, Jimenez-Rubio A, Jimenez-Planas A. In vitro effect of parachlorophenol and camporated parachlorophenol on macrophages. J Endodon 1997;23:728-30.

PURPOSE: The determine the effect of parachlorophenol and CMCP on inflammatory macrophage adhesion.

M&M: Inflammatory macrophages were obtained from Wistar rats and suspended in RPMI-1640 medium. As a test of macrophage phagocytic function, the adherence capacity of macrophages to a plastic surface was determined. Parachlorophenol and CMCP were directly dissolved into the RPMI-1640 medium to a final dilution of 1:10, 1:100, or 1:1000 in the incubation medium. Adherence assays were performed at 15 min of incubation at 37 degrees in a humidified atmosphere of 5% CO2. Controls were used.

RESULTS: Parachlorophenol and CMCP significantly inhibited substrate adherence capacity of macrophapes in a dose-dependent manner.

C&C: Using these two compounds could inhibit macrophage function and modulate immune and inflammatory reactions in periapical tissues.

December 1997 **Michael J. Mauger**

Silvaggio J, Hicks ML. Effect of heat sterilization on the torsional properties of rotary nickel-titanium endodontic files. J Endodon 1997;23:731-4.

PURPOSE: To determine whether heat sterilization adversely effects the torsional properties of rotary nickel-titanium files, making them more prone to fracture under torsional stress.

M&M: 100 files of each size from 2 - 10 .04 taper Profile Series 29 files were tested. Files were tested before being sterilized to establish baselines, then after 1, 5, or 10 sterilization cycles in a steam autoclave, Statim autoclave, or a dry heat sterilizer. All instrument testing was performed on a Torqumeter Memocouple.

RESULTS: All groups tested surpassed the ANSI/ADA Specification No. 95. Heat sterilization of rotary nickel-titanium files up to 10 times does not increase the likelihood of instrument fracture.

C&C: Torsional strength and not rotational flexibility is the most important factor in determining when an instrument will break. If a change in torsional strength occurs with sterilization, it will most likely be an increase rather than a decrease in strength.

December 1997 **Rodney M. Waite**

Kuhn WG, Carnes DL, Clement DJ, Walker WA. Effect of tip design of nickel-titanium and stainless steel files on root canal preparation. J Endodon 1997;13:735-38.

PURPOSE: To evaluate the effect of modified and nonmodified tip designs of both stainless steel and nickel-titanium endodontic hand files on root canal transportation, centering ratio, and dentin removal using a modified Bramante technique.

M&M: 48 mesial canals from 24 extracted mandibular molars were randomly distributed by curvature among four experimental groups of 12 canals each. Group 1 was instrumented with the Onyx-R file; Group 2 was instrumented with the Flex-R file; Group 3 with the Mity file; and Group 4 was instrumented with Kerr standard files. Using the Bramante technique, the canals were digitally imaged, filed up to size 25, imaged, then filed to a final size of 40 with a step-back using a quarter turn pull technique. The canals were irrigated with 2.5% NaOCl after each file. The transportation, centering ratio, and dentin removal was then determined.

RESULTS: Canals instrumented to a #25 with nickel-titanium files (Onyx-R or the Mity file) were transported significantly less than canals instrumented with stainless-steel files. When instrumented to size 40 apically with step-back, the Onyx-R transported the canals significantly more in the midroot region than either the Mity file, Flex-R or the K-file. There were no significant differences in the amount of dentin removed in any of the groups in the apical section when canals were instrumented to a size 25 file. The nickel-titanium files stayed centered better than stainless steel files at size 25.

C&C: The transportation in the midroot area is probably not clinically significant, especially when preflaring is performed.

December 1997 **Michael J. Mauger**

Uemura M, Hata G, Toda T, Weine FS. Effectiveness of eucalyptol and d-limonene as gutta-percha solvents. J Endodon 1997;23:739-41.

PURPOSE: To investigate d-limonene and eucalyptol for their ability to dissolve gutta-percha in a simulated clinical environment.

M&M: Epoxy resin blocks (18 per group) were prepared with a step-back technique. Group 1 was filled by lateral condensation, Group 2 using the Obtura II system, Group 3 using the Ultrafil system and Group 4 utilizing Thermafil plastic carriers. The gutta-percha of six blocks in each group was exposed to eucalyptol, d-limonene or chloroform for 30 sec, then a #15 Hedstrom file attached to a Root ZX apex locator was inserted. The amount of time between the beginning of file insertion and just reaching the apex was recorded. A #60 reamer was likewise inserted.

RESULTS: The times for file insertion did not differ significantly among the three solvents used. The reamer times did differ. The combined times indicated that Ultrafil took the least amount of time to remove with all solvents being equal; Themafil took the longest with chloroform being the best solvent; overall chloroform was the best solvent.

December 1997 **Rodney M. Waite**

Thompson SA, Dummer PMH. Shaping ability of lightspeed rotary nickel-titanium instruments in simulated root canals. Part 2. J Endodon 1997;23:742-7.

PURPOSE: To assess the ability of the Lightspeed rotary instruments to shape simulated canals in clear resin blocks.

M&M: 40 root canals were produced, with either 20 or 40 degree curves and with a straight portion before the curve of either 8 or 12 mm. The radius of the arc making up the curved aspect of the canal was 16 mm. Ten canals of each shape were prepared using a constant speed of 750 rpm. All canals

were prepared to a working distance of 16 mm and to a Lightspeed size 35 master apical file. Each instrument was used four times before being replaced. Step-back was used up to a size 70 instrument. The canals were assessed using imaging software of pre and postoperative shapes.

RESULTS: Only one zip and one elbow were created, with no ledges, perforations, danger zones, or blockages being produced. The degree of absolute transportation was small with no significant differences between the canal shapes in the region apical to the curve.

C&C: Lightspeed seemed to stay mostly centered but tended to produce canals which lack taper and flow. It was suggested that a more radical step-back be used to overcome this problem. This technique appears to work best in the apical aspect of the canal.

December 1997 **Michael J. Mauger**

Komori T, Yoloyama K, Takato T, Matsumoto K. Clinical application of the erbium: YAG laser for apicoectomy. J Endodon 1997;23:748-50.

PURPOSE: To report a case of apicoectomy using the Er:YAG laser.

CASE REPORT: A clinical diagnosis of a radicular cyst of the maxillary left canine was made before apicoectomy. The Er:YAG laser was used to remove thinned bone over the apical area and the cyst enucleated with surgical curettes. The laser was applied and resection of the apex performed. After RCT, the extruded gutta-percha was cut by the laser. Healing was uneventful after 7 m.

C&C: The advantages of the Er:YAG laser for apicoectomy are: absence of vibration, less chance for contamination of the surgical site, and reduced risk of trauma to adjacent tissue. Disadvantages include: only fair cutting efficiency and loss of tactile feedback.

December 1997 **Rodney M. Waite**

Kobayashi C, Yoshioka T, Suda H. A new engine-driven canal preparation system with electronic canal measuring capability. J Endodon 1997;23:751-4.

PURPOSE: To present a new handpiece capable of determining canal measurement and reversing instrument which reach the apical foramen.

SUMMARY: This article was more of an ad for their handpiece than a study. This cordless engine driven handpiece has a Root ZX mounted inside to measure canal length. The engine is driven with a rechargeable battery, and it works more than 40 min without a recharge. The files are rotated at 240-280 rpms. When the file tip reaches the apical constriction, the revolution of the file can be automatically reversed. If there is too much torque, the rotation is automatically reversed. These features are thought to help make the nickel-titanium instruments safer.

December 1997 **Michael J. Mauger**

Shimauchi H, Takayama S, Miki Y, Okada H. The change of periapical exudate prostaglandin E_2 levels during root canal treatment. J Endodon 1997;23:755-8.

PURPOSE: To investigate the longitudinal changes of PE (periapical exudate) - PGE_2 levels during root canal treatment.

M&M: Samples of periapical exudates were obtained from root canals of 20 teeth with or without radiolucent areas around the periapex. All clinical signs were evaluated and recorded. The samples were taken at two sequential treatment visits with an interval of 7 to 10 d during the routine RCT. A #40 paper point was used and measurements of PGE_2 made. The first sample was obtained immediately after the establishment of WL, and the second sample at the next treatment visit.

RESULTS: The mean PE-PGE_2 value of the first samples was 158 pg/µl and 48.4 at the second visit. Fourteen out of 15 teeth with improved clinical findings at the second sampling visit showed decreased PE-PGE_2 levels as compared to those at the first visit. Only one out of five teeth with unimproved clinical findings at the second visit fell.

C&C: Prostaglandin E_2 effects include recruitment of inflammatory cells, production of collagenase, and stimulation of osteoclastic activity. A decreased PE-PGE_2 level was a result of endodontic treatment and was correlated with an improved clinical picture. PE-PGE_2 levels may be used as a dynamic indicator of disease activity of PA lesions.

December 1997 **Rodney M. Waite**

Aguirre AM, El Deeb ME, Aguirre R. The effect of ultrasonics on sealer distribution and sealing of root canals. J Endodon 1997;23:759-64.

PURPOSE: To compare the ultrasonic and hand methods of sealer placement using three types of sealers: Sultan "Grossman's formula", AH-26, and CRCS. The effect of these methods on radiographic density, sealer distribution, and the apical seal was evaluated.

M&M: 130 mandibular incisors and 42 MB canals in maxillary first and second molars were used for this study. The teeth were divided first into two main groups. Half were to have sealer placed with an ultrasonically activated file and the other half using the same file by hand. Within each main group different groups of sealers were used as mentioned above. Controls were also used. The canals were instrumented to size 35 master apical file with a 1mm stepback to a #60 file and coronal flaring with Gates Glidden burs. Three radiographs were taken: Pre-obturation, post-sealer placement, and post-obturation. The radiographs were scanned for density and distribution. The apical seal was assessed after the teeth were suspended in India ink for 2 wks. The teeth were sectioned at 3 and 7mm to permit the measurement of the canal diameter at the same level of the scanning of the radiographs.

RESULTS: Ultrasonic placement of sealer was superior to hand placement only when CRCS sealer was used. There was not a statistical difference in leakage among the groups. Ultrasonic placement of sealer gave a higher incidence of sealer extrusion.

C&C: Ultrasonics may enhance the placement of some sealers such as CRCS; but not of others like AH-26 or Grossman's.

December 1997 **Michael J. Mauger**

Sauveur G. Improvement of the rubber dam frame. J Endodon 1997;23:765-7.

PURPOSE: To propose an improvement of the rubber dam frame for obtaining the endodontic operative field.

SUMMARY: The articulated rubber dam frame has a double hinge allowing it to fold in half and a brace at the bottom to create a reservoir. Advantages include: facilitating taking of radiographs, protection of the patient against the accidental leakage of therapeutic liquids, facilitating rapid aspiration in cases of unexpected leakage of irrigation solution, and ease of administration of supplementary anesthetic injection.

C&C: Sounds good to me.

December 1997 **Rodney M. Waite**

Bender IB, Byers MR, Mori K. Periapical replacement resorption of permanent, vital, endodontically treated incisors after orthodontic movement: Report of two cases. J Endodon 1997;23:768-73.

PURPOSE: To present two case studies of Periapical Replacement Resorption (PARR).

SUMMARY: The incidence of PARR that follows orthodontic treatment has been reported to be 19 to 31.4% in all or some of the anterior teeth; it is highest in maxillary incisors and lower in the mandibular anterior teeth; the canines and molars manifest the least radiographic PARR. PARR occurs not only after orthodontic treatment, but also in unrelated cases like idiopathic root resorption. This occurs mainly in the posterior teeth, especially the distal root of mandibular molars bilaterally. PARR occurs mainly in teeth with vital pulps after orthodontic movement; but can occur in endodontically treated teeth to a lesser degree. The neuropeptides produced in the vital pulps have been suggested to play a role in the PARR. It is hypothesized that with orthodontic movement neuropeptides are released causing an increase in blood supply to areas of osteoclastic activity. Endodontic treatment and calcium hydroxide have been shown to stop PARR after orthodontic movement; but is not recommended yet as a preventive measure to arrest apical resorption after orthodontic movement.

December 1997 **Michael J. Mauger**

ARTICLES OF ENDODONTIC INTEREST FROM OTHER JOURNALS

Fuss Z, Trope M. Root perforations: classification and treatment choices based on prognostic factors. Endod Dent Traumatol 1996;12:255-64.

PURPOSE: To review the factors which affect the prognosis of root perforations, to suggest a classification reflective of these prognostic predictors, and to suggest treatment protocols which will result in the highest possible success rate.

SUMMARY: The prognosis of root perforations is dependent on the prevention or treatment of bacterial infection of the perforation site, and the use of non-irritating materials to seal the perforation thus limiting the periodontal inflammation. Factors which are significant in affecting the prognosis of the repair are: time between occurrence and treatment (more favorable if sealed immediately), the size (small perforations are associated with less tissue destruction /inflammation and thus more predictable healing) and the location. Location is probably the most important factor. Perforations in close proximity to the gingival sulcus can lead to contamination and epithelial migration into the area creating a periodontal defect. Coronal and apical perforations have a better chance of success than crestal perforations. Perforations in the furcation area of multirooted teeth are regarded as crestal perforations to due proximity to the epithelial attachment in the gingival sulcus. The classification for perforations proposed is as follows:

Root perforation
Lateral or furcal

Fresh	Old
Small	Large
Apical-coronal	Crestal
←	→
Good prognosis	Poor prognosis

Fresh is associated with a perforation at the same visit. Old refers to perforations previously untreated. Small perforations are those which occur with endodontic instruments of size 15 or 20. Coronal = coronal to the crestal bone and epithelial attachment. Crestal = at the level of the epithelial attachment. Apical = apical to the crestal bone and epithelial attachment. Categories to the left are associated with good prognosis vs. poor prognosis on the right side. Treatment options are presented based on the position of the perforation relative to the crestal bone and attachment apparatus. Generally nonsurgical treatment is indicated for management of root perforations, while surgical intervention is reserved for cases not amenable or failed in response to nonsurgical attempts.

December 1996 **Orest M. Harkacz, Sr.**

Cohenca, N, Rotstein I. Mental nerve paresthesia associated with a non-vital tooth. Endod Dent Traumatol 1996;12:290-300.

SUMMARY: A case report of a woman referred for endodontic treatment of the left mandibular second premolar. She had her 3rd molars removed 2 months prior. One month following the extractions, she developed an intermittent numbness sensation in the lower left lip and chin, and the related buccal gingiva. The numbness was episodic, lasting 3-4 days. Two weeks prior to the endodontic evaluation she noted a buccal swelling in the premolar area which resolved following a course of antibiotics. The premolar had extensive caries, and a periapical radiolucency in close approximation to the mental foramen. The tooth was asymptomatic, and non-responsive to pulp vitality tests. The soft tissue lacked sensation when pricked with an explorer. Endodontic treatment was accomplished in 2 visits, with calcium hydroxide paste applied as an intracanal medicament. Five days after the first appointment, the numbness resolved and all sensation returned. During a 12 month follow-up period, the patient remained asymptomatic, the numbness did not return, and rapid apical healing was noted.

C&C: The authors note that paresthesia resulting from 3rd molar surgery usually occurs 1 - 7 days post surgery. In this case, the extraction could not be ruled out as a possible etiological factor. Source of the paresthesia here could be the inflammation process - a local edema &/or byproducts.

December 1996 **Robin E. Hinrichs**

Waplington M, Lumley PJ, Walmsley AD. Incidence of root face alteration after ultrasonic retrograde cavity preparation. Oral Surg 1997;83:387-92.

PURPOSE: To asses root end crackings by SEM after ultrasonic cavity preparation over a range of power settings with different tip designs, and to compare with rotary bur retropreparation.

M&M: A Neosonic unit set in the scaling mode, was used with either the CT1 or CT2 tips. Power settings were 2, 4, 6, 8, or 10. After preparation and obturation of the canals, the apical 3 mm was resected at 90^0 and prepared for 2 min with the tips at the various power settings. One group used a #1 rotary steel bur in a contra-angle. Preparations were 3 mm deep, and the load applied never exceeded 20 gm. Models of the prepared roots were made and examined under the SEM.

RESULTS: No evidence of root face cracking was found in any specimen for either tip at any power setting. Chipping of the cavosurface margin was noted. The CT2 tip caused more marginal chipping than the CT1. ANOVA revealed that increased power settings resulted in a significant increase in marginal chipping. There was no evidence of chipping in the rotary bur specimens.

C&C: The authors note that lower power settings slowed gutta-percha removal, but that 2 minutes was adequate at all power settings to complete the preparations. One of the advantages of this unit is the ease with which a sterile water supply can be used. I would like to see this study replicated with the use of the diamond-coated tips.

March 1997 **Robin E. Hinrichs**

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March 1997 **Robin E. Hinrichs**

Pettiette M, Hupp J, Mesaros S, Trope M. Periodontal healing of extracted dogs' teeth air-dried for extended periods and soaked in various media. Endod Dent Traumatol 1997;13:113-8.

PURPOSE: To examine, histologically, the healing of the periodontium of extracted dogs' teeth, stored dry for periods ranging from 30 to 60 min, and soaked in one of three enriched media for 30 min before replantation.

M&M: A total of 104 mature roots from beagle dogs were used in study. The roots were treated endodontically then extracted. Eight roots were extracted and then immediately replanted and served as negative controls. The other roots were divided into three groups of 32 roots. One group was bench dried for 30 min, one for 45 min and the other for 60min. Each group was subdivided into four groups of eight roots each, which were either replanted without soaking (positive control), or soaked for 30 min in Hanks Balanced Salt Solution (HBSS), ViaSpan, or Conditioned Medium. The dogs were sacrificed six months after replantation and the teeth were prepared for histological examination.

RESULTS: The best healing occurred when the teeth were replanted immediately (89%). An increased dry time without soaking resulted in progressive decrease in healing (72% to 39% to 31%). Soaking in Conditioned Medium before replantation was not beneficial for any of the dry times tested. Soaking in HBSS before replantation was not beneficial after 45 min dry time (23% healed) but there was an increase in healing to 49% after soaking after 60 min dry time. Soaking in ViaSpan before replantation resulted in consistently high healing results for all dry times tested.

C&C: For the highest success rate, immediate replantation of an avulsed tooth should be performed. An avulsed tooth that has been left dry for 30 min should be replanted immediately without soaking. Teeth that have been dry for 45 or 60 min would benefit from soaking for 30 min in Via Span.

June 1997 **Michael J. Mauger**

Advisory Statement. Antibiotic prophylaxis for dental patients with total joint replacements. JADA 1997;128:1004-8.

PURPOSE: To present a report adopted by the ADA and the American Academy of Orthopaedic Surgeons concerning antibiotic prophylaxis and total joint arthroplasties.

SUMMARY: Immunocompromised patients with total joint replacements, undergoing dental procedures with a higher bacteremic incidence, should be considered as needing antibiotic prophylaxis. A patient with a total joint prosthesis may present to the dentist with a recommendation from his or her physician that is not consistent with these guidelines. The dentist is encouraged to consult with physician to determine if there are any special

considerations or may share a copy of these guidelines with the physician. The dentist is ultimately responsible for making treatment recommendations for his or her patients based on the dentist's professional judgment.

Patients at potential increased risk of hematogenous total joint infection: rheumatoid arthritis; SLE; disease, drug or radiation induced immunosuppression; Type I diabetes; first two years following joint placement; previous prosthetic joint infections; malnourishment; hemophilia.
Higher incidence of bacteremic dental procedures include: endodontic instrumentation or surgery only beyond the apex, intraligamentary local anesthetic injections. Lower incidence procedures which do not require prophylaxis include: local anesthetic injections, intracanal endodontic treatment.
The suggested regimens are: patients not allergic to penicillin: cephalexin, cephradine or amoxicillin 2 g orally 1 h prior to dental procedure. Penicillin allergic patients: clindamycin 600 mg orally 1 h prior to the dental procedure.

C & C: I recommend everyone read the full text and tables.

July 1997 **Rodney M. Waite**

Sauveur G, Sobel M, Boucher Y. Surgical treatment of a lateroradicular lesion on an invaginated lateral incisor (dens in dente). Oral Surg 1997;83:703-6.

PURPOSE: A report of the successful treatment of an invaginated tooth presenting a lateroradicular lesion caused by the invaginated structure.

SUMMARY: The internal anatomy presents problems that might result in failure with the root canal treatment by not always ensuring a root canal filling extending to the apex. Therefore some authors propose a surgical approach by apical resection extending to the limit of the root canal filling. When this approach is not possible, a retrograde filling may be indicated.
A 22 yo m presented with a sinus tract near the max left lateral incisor. RCT had been performed 2 y previously. Radiographic examination showed an invagination and a lateroradicular lesion. Treatment involved an incision, curettage of the lesion, placement of an alginate-calcium fiber and surgical wax around the apex, and cleaning the cavity with 2% NaOCl. The fibers and wax were removed and the cavity coated with ZOE cement, then gutta-percha in plastic form placed with an amalgam carrier, compacted with a spreader, and cold burnished. The osseous cavity was filled with Biocorail. A suture was placed and an antibiotic, anti-inflammatory, and mouthwash prescribed. Radiographs at 30 d and 60 m showed evidence of healing

C&C: A surgical procedure that may be of benefit in treating the complex anatomy of a dens invaginated tooth.

July 1997 **Rodney M. Waite**

Green TL, Walton RE, Taylor JK, Merrell P. Radiographic and histologic periapical findings of root canal treated teeth in cadaver. Oral Surg 1997;83:707-11.

PURPOSE: To interpret and correlate the radiographic findings of RC treated teeth with the histologic appearance of the periapical tissues and to compare the results with Brynolf's report.

M&M: Specimens were obtained from cadavers. Maxillas and mandibles were removed en bloc, radiographed, and those teeth that had received RCT were identified, for a total of 29 teeth. RC treated teeth were evaluated for success or failure by radiographic appearance by two trained observers. Serial sections at 6 Mm, very near or through the apical foramen, were obtained, stained, and examined by light microscopy. Ten teeth exhibiting normal radiographic appearance were also prepared. Apices were examined for the presence of inflammatory cells.

RESULTS: None of the control teeth exhibited PA inflammation. All 10 specimens (100%) with PA rarefactions showed inflammatory cell infiltration of varying severity surrounding the apical foramen. The 19 specimens without PA radiolucencies displayed a variety of histologic findings from none to slight to moderate inflammation. Of these, 5 (26%) that appeared radiographically normal had histologic signs of inflammation. The majority (74%), which were radiographically normal, did not exhibit PA inflammation.

C&C: The results showed that a PA radiolucency indicated an inflammatory process, whereas the absence of a PA radiolucency usually, but not always, indicated the treated tooth periapex to be free of inflammation. All root canal treatments examined with a PA radiolucency showed inflammation with no evidence of scar tissue repair.

July 1997 **Rodney M. Waite**

Rubenstein, R. Endodontic microsurgery and the surgical operating microscope. Compend Contin Educ Dent 1997;18:659-72.

PURPOSE: To describe the advantages of the surgical operating microscope.

SUMMARY: The advantages of the surgical operating microscope (SOM) are: visualizing the surgical field, evaluating the surgical technique, reducing the number of radiographs needed, expanding patient education through video use, providing reports to referring dentists and insurance companies, and creating documentation for legal purposes. The most significant advantage is in visualizing the surgical field.
Microsurgical technique: Apicoectomy (their usage of the term) is performed with a 170L tapered fissure bur in an Impact Air 45 handpiece. Apical preparations are now made with ultrasonic technology. Another development is the surgical micomirror. Using the SOM, it is now possible to look up into the apical preparation to check for completeness of tissue removal. A device that fits over a triflow syringe and allows for the directional microcontrol of air and water was developed by Dr. Stropko. Retrofilling materials such as SuperEBA are used.
A recent study showed that the success rates of endodontic surgery performed under the SOM with microsurgical technique and using SuperEBA cement as the root end filling material was 96.8%.

CC: A brief overview of the advantages of the surgical microscope and microsurgery techniques

July 1997 **Rodney M. Waite**

Kim S. Principles of endodontic microsurgery. Dent Clin N Am 1997;41:481-98.

SUMMARY: Magnification, illumination, and instruments constitute a microsurgery triad. Apical surgery can now be performed with accuracy and predictability, eliminating the guess factor inherent in conventional endodontic surgery. Microsurgery has the advantages of precisely identifying the apex, leaving a small osteotomy, keeping the root-end bevel flatter, easily identifying isthmuses, and cleaning the long axis of the canal more simply. Another advantage of examining the resected root surface under the microscope is the identification of the causes of endodontic failure. The most frequent causes are missed canals, poor canal obturation, and microfractures. The microscope and microsurgical techniques permit the identification and management of the entire root canal system predictably and precisely. The ideal bevel is an angle of less than 10 degrees made during root-end resection. This is easily accomplished with microsurgery. Hemostasis is important during any surgery. The use of local anesthetic with 1:50,000 epinephrine is the first means to obtaining good hemostasis. For additional local hemostasis, epinephrine pellets applied with pressure inside the bleeding bone crypt provides reasonable hemostasis. Small persistent bleeders on the buccal surface can be easily managed with a dab of ferric sulfate. Another effective local hemostatic technique employs calcium sulfate paste packed into the bone crypt. After the surgery, the calcium sulfate is left in the crypt because it is slowly resorbed, while providing a lattice for the bone cells repopulating the crypt.

C&C: General, good overview of the advantages of microsurgery.

September 1997 **Michael J. Mauger**

Kim S, Rethnam S. Hemostasis in endodontic surgery. Dent Clin North Am 1997;41:499-511.

SUMMARY: Hemostasis is necessary to achieve a dry field, allowing good visualization and placement of a retrograde filling material. Stages of hemostasis after vessel severance are contraction of the vessel, formation of a platelet plug, and formation of the blood clot. Hemostasis in a surgical procedure has 3 stages: presurgical, surgical, and postsurgical. Presurgical hemostasis involves management of any medical condition that may lead to prolonged or excessive bleeding and the use of local anesthetic with vasoconstrictor. The ideal adrenergic vasoconstrictor should be a pure alpha-agonist since these receptors initiate vasoconstriction. Epinephrine is a potent stimulator of both alpha and beta receptors. Norepinephrine and levonordefrin are not preferred over epinephrine for patients with heart disease; they have the same potential for impairing myocardial oxygenation and can place more stress on the heart than epinephrine because of their tendency to increase peripheral resistance and cardiac overload. For good hemostasis, 1:50,000 epinephrine is indicated. The maximum dose of 1:50,000 epi is 5.5 cartridges (11 of 1:100,000 epi). Hemostasis after incision and flap reflection by injecting into the soft and osseous tissue may often prove futile. Avoid injecting into muscle since epinephrine produces vasodilation. The rate of injection should be 1 or 2 ml/min. Reactive hyperemia rebound is due to localized tissue hypoxia and acidosis caused by prolonged vasoconstriction. Surgical hemostasis includes topical hemostats such as bone wax, which has a purely mechanical method of action. Vasoconstrictors such as Racellets, Epidri and Radri are cotton pellets soaked in epinephrine. Ferric sulfate, (Cut-Trol, Viscostat, Astringedent) work by agglutinating blood proteins which form plugs that occlude capillary orifices. Topical thrombin clots fibrinogen. The absorbable hemostatic agents include calcium sulfate, which mechanically plugs vascular channels and is biocompatible; Gelfoam, which promotes disintegration of platelets; collagen, which causes aggregation of platelets; microfibrillar collagen hemostat; and Surgicel, which acts as a mechanical block or artificial coagulum. Postsurgical hemostasis is accomplished by placing a wet gauze over the flap prior to suturing and immediately after suturing. Also, a cold compress can counteract hyperemia.

C & C: A good overview of surgical hemostasis.

September 1997 **Rodney M. Waite**

Hsu Y, Kim S. The resected root surface The issue of canal isthmuses. Dent Clin N Amer 1997;41:529-40.

SUMMARY: In the past, the canal isthmus was often overlooked, and it was also difficult to prepare if located. Now, with the adjunct of the surgical operating microscope and microsurgical equipment, clinicians can view the resected root surface, better, identifying the isthmus, and prepare it with an ultrasonic tip. The recognition and management of the canal isthmus is one factor that may improve the success rate of surgical endodontics in posterior teeth. An isthmus is defined as a corridor between the two roots. Isthmuses are important to consider in roots which have two canals, such as,

the MB root of maxillary molars, the mandibular molars, and mandibular incisors. There are five classifications of the canal isthmus. Type I was defined as either two or three canals with no notable communications. Type II was defined as two canals that possessed a definite connection between the two main canals. Type III differs from the latter only with the presence of three canals instead of two. Type IV are those canals which extend into the isthmus like a tear drop. Type V was recognized as a true connection or corridor throughout the section. The incidence of isthmuses in these roots is such that they must be accounted for in the root-end preparation and filling during microsurgery.

C&C: Well written and contained good information.

September 1997 **Michael J. Mauger**

Carr GB. Ultrasonic root end preparation. Dent Clin North Am 1997;41:541-54.

SUMMARY: The creation of a retropreparation and placement of a retrofilling material is an attempt to hermetically seal any actual or potentially noxious agent within the root. Major errors of retropreparation are: 1. failure to place retropreparation down longitudinal axis. Previously the tools to perform this task were too gross and unrefined. 2. Retropreparation lacks sufficient retention form. Undercuts further weakened the root dentin. 3. Failure to extend preparation in B/L direction. Most roots are wider in a B-L direction, which results in oval-shaped beveled root surfaces. Failure to account for this extension results in preparations that are inadequately extended and subject to leakage. 4. Retropreparation fails to include isthmus areas. Ultrasonic root end preparations are easily placed. After an appropriate cavity design is planned, the extent of the preparation is scratched into the dentin by hand, using retrograde explorers, then the ultrasonic tip is activated dry to deepen slightly the hand-etched groove. The tip is activated with water. This technique produces a smooth, conservative, machined preparation, placed 3 mm in the canal, with nearly parallel walls.

C&C: Basic advantages of ultrasonic root end preps.

September 1997 **Rodney M. Waite**

Watzek G, Bernhart T, Ulm C. Complications of sinus perforations and their management in endodontics. Dent Clin N Amer 1997;41:563-83.

SUMMARY: The intimate position of the maxillary sinus to the apices of teeth creates problems if periapical inflammation occurs. This can lead to a perforation into the sinus and cause sinusitis. Persistent and complicated situations that do not respond after nonsurgical root canal treatment demand a suitable surgical therapy. Knowledge of the specific anatomic conditions, an adequate diagnosis, and appropriate surgical procedure facilitate success rates that are comparable with those obtained in other regions, even in unfavorable initial conditions. If a sinus perforation occurs during periapical surgery, it is imperative that no foreign bodies have been left in the sinus. The patient should be told that a nose bleed up to 48 hours after surgery is common. Drops that reduce mucosal swelling should be administered to ensure adequate ventilation. The patient should also be instructed not to produce any increase within the sinus because this involves the risk of a mouth-antrum fistula and an air emphysema. A sinus perforation has no effect on the long-term success or failure of the treatment.

C&C: Good overview of sinus perforations

September 1997 **Michael J. Mauger**

Pecora G, Baek S, Rethnam S, Kim S. Barrier membrane techniques in endodontic microsurgery. Dent Clin North Am 1997;41:585-602.

SUMMARY: The goal of endodontic microsurgery is regeneration of PA tissues. *Regeneration* is the replacement of destroyed tissue with new tissue formed by the cells of the same origin. *Repair* is the restoration of the tissue destroyed by disease with new tissue consisting of cells different from the original cells. Through-and-through osseous defects may allow ingrowth of connective tissue and can result in PA scarring, which is often misdiagnosed as pathology. Barrier membranes prevent invasion of nonosteogenic cells. A study mentioned suggested that membrane barrier techniques generally improved the bone regeneration in through-and through PA defects. Bioresorbable and nonresorbable membranes both resulted in significant improvements in attachment levels and probing depths. Indications for guided tissue regeneration in endodontic surgery are: through-and through PA lesions, large PA lesions, and endo-perio lesions. The combined endo-perio lesion has the least favorable prognosis when GTR is used. Calcium sulfate has been shown to perform better as a barrier than membranes. Indications for calcium sulfate are: postapicoectomy bone defects, through-and-through lesions, PA lesion w/furcation involvement, and postsurgical endo-perio communications.

C&C: Barrier membrane techniques can enhance the quality and quantity of bone regeneration in PA lesions.

September 1997 **Rodney M. Waite**

Fava LRG, Dummer PMH. Periapical radiographic techniques during endodontic diagnosis and treatment. Int Endodon J 1997;30:250-61.

SUMMARY: To review the various radiographic techniques which can be applied in endodontics and describe how substantial benefits can be gained by clinicians in their daily practice. To obtain maximum information it is necessary to expose at least two radiographs of a tooth, one taken at the normal, standard (direct) angle and the other with an altered angulation. Although having the potential to improve diagnosis, radiographs taken with eccentric

beam angulations and altered film placement are inherently less distinct, as the images lose the normal sharpness expected from standard films. Increasing the vertical angulation helps to give a more accurate visualization of lingual roots and their apices. It also helps in determining whether anatomical landmarks lie buccally or lingually, an assessment which has benefit during endodontic surgery. Change in horizontal angulation will help in the identification of multiple roots and canals. The buccal object rule is used to determine which canal is buccal or lingual. The triangular scanning technique can be used to detect the exact position of root curvatures as well as iatrogenic errors such as ledges, creation of false channels during canal and post space preparation and lateral perforations. The technique involves the exposure of three films, one using the standard angulation and the others using mesial and distal angulations.
CC: A general overview of radiographic techniques.

September 1997 **Michael J. Mauger**

Trope M, Hupp JG, Mesaros SV. The role of the socket in the periodontal healing of replanted dogs' teeth stored in ViaSpan for extended periods. Endod Dent Traumatol 1997;13:171-5.

PURPOSE: To re-evaluate the healing of extracted dogs' teeth stored for extended periods and to compare the healing of teeth stored in ViaSpan for 6 h and replanted into sockets of different time periods.

M&M: Ninety-six roots from 6 dogs were used. Forty-eight canals were instrumented and obturated to prevent subsequent development of inflammatory root resorption. Group 1- 8 teeth to be replanted immediately; group 2 - 8 teeth stored in ViaSpan for 6 h and replanted into 6 h sockets; group 3 - same as 2 but replanted into 48 h sockets; group 4 - same as 2 but replanted into 96 h sockets; group 5 - stored in ViaSpan for 48 h and replanted into 48 h sockets; group 6 - stored in ViaSpan for 96 h and replanted into 96 h sockets. Twelve w after replantation the dogs were killed. Jaws were fixed, decalcified, embedded, sectioned, stained and evaluated. The appearance of the root surface was evaluated and classified. Healing patterns for each group and individual teeth in each group were determined.

RESULTS: The best results were when the teeth were replanted immediately. For the teeth stored in ViaSpan for 6 h, complete healing decreased significantly as the age of the socket increased. The rate of replacement resorption increased significantly with increasing socket age for the 6 h stored teeth.

C&C: The socket environment plays an important role in the healing of replanted teeth in dogs. In the future we may be able to change the environment of the socket to be less destructive upon replantation or manipulate it to be conducive to the healing of teeth.

September 1997 **Rodney M. Waite**

Barrieshi KM, Walton RE, Johnson WT, Drake DR. Coronal leakage of mixed anaerobic bacteria after obturation and post space preparation. Oral Surg Oral Med Oral Pathol 1997;84:310-4.

PURPOSE: To assess bacterial leakage of a mixed anaerobic community of organisms in obturated canals after post space preparation.

M&M: Forty extracted human maxillary anterior teeth were accessed, cleaned and shaped and obturated with gutta-percha and Roth's sealer. A hot plugger was used to prepare a post space. Group 1 was the experimental group; group 2 the negative control; and group 3 the positive control. Fusobacterium nucleatum, Peptostreptococcus micros and Campylobacter rectus were added to an in vitro model system. The specific leakage time in days for each organism to penetrate through the obturating material was determined.

RESULTS: Eighty percent of the teeth demonstrated coronal leakage of Fusobacterium nucleatum and Campylobacter rectus by the 90 day interval. Bacterial penetration occurred from 48 to 84 days. The positive and negative controls worked as expected.

C&C: The mixed species of bacteria are frequently isolated from infected root canals. Leakage occurs after loss of the coronal seal.

September 1997 **Rodney M. Waite**

Morse DR. Endodontic-related inferior alveolar nerve and mental foramen paresthesia. Compendium 1997;18:963-83.

SUMMARY: This article discusses the endodontically related causes of paresthesia as well as prevention and treatment methods. Local anesthetic-related paresthesia is usually transitory lasting one to three days. Paresthesia can be a result of mechanical pressure on the nerve bundle due to inflammation and edema. Microbial products can breach the protective perineurium and impair conduction. In endodontic cases, paresthesia can be caused by overinstrumentation , obturation, or direct physical injury during periapical surgery. If paresthesia related to overfill occurs with a gutta-percha/sealer case, and the paresthesia is not resolving within 2 months, the dentist should refer the patient to an oral surgeon to perform periapical surgery to remove the excess material. The use of dexamethasone to help resolve paresthesia was discussed.

October 1997 **Michael J. Mauger**

Paul BF, Hutter JW. The endodontic-periodontal continuum revisited: new insights into etiology, diagnosis and treatment. JADA 1997;128:1541-8.

PURPOSE: To examine the relationships between endodontics and periodontics in light of recent data and to explore contemporary approaches to treatment and avenues to future research.

SUMMARY: Jansson demonstrated that teeth with periradicular lesions had significantly more attachment loss and greater pocket depth than teeth without lesions. Kobayashi reported similar microfloras associated with noncarious, nonvital pulps and deep periodontal pockets. When a possible endo-perio lesion is suspected, the first task is to assess the endodontic status of the tooth. Diagnostic probing and vitality testing are important, but interpretation of the testing in the presence of advanced periodontal disease may not be predictable. Blomlof concluded that an intrapulpal infection tends to promote marginal epithelial downgrowth along a denuded dentin surface. Some studies were presented which described concerns about the possibility that endodontically treated teeth might not respond to periodontal therapy. The authors stated that a body of literature supports the benefits of periodontal therapy in conjunction with endodontic treatment. Cements and regenerative materials are being used to treat combined lesions resulting from root perforations and fractures.

C & C: Advanced periodontal disease may affect endodontic health, endodontic pathosis may be a risk factor for loss of periodontal attachment, and regenerative therapy along with restorative materials may offer promise in salvaging previously hopeless teeth.

November 1997 **Rodney M. Waite**

Barkhordar RA, Watanabe LG, Marshall GW, Hussain MZ. Removal of intracanal smear by doxycycline in vitro. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1997;84:420-3.

PURPOSE: To assess the ability for smear layer removal by doxycycline compared to other irrigants.

M & M: Forty-eight palatal roots of extracted molars were accessed, cleaned and shaped to size 30 K file and irrigated with 2.5% NaOCl or sterile saline. During instrumentation, the pulp chamber was flooded with any of four different solutions: 15% EDTA, 25 mg/ml doxycycline HCl (DH), 50 mg/ml DH, 100 mg/ml DH. C and S'ing was complete at a size 60 file and the teeth were longitudinally split and prepared for SEM. A ranking system based on the percentage of remaining debris and smear layer was used to evaluate the specimens.

RESULTS: DH of 100 mg/ml was the most effective in removing smear layer in the saline group and both 50 mg/ml and 100 mg/ml DH were more effective than EDTA in the NaOCl group.

C & C: Doxycycline HCl and NaOCl remove the smear layer better than EDTA.

November 1997 **Rodney M. Waite**